U.S. Army. Signal Corps

ANNUAL REPORT, 1889|90.

OF THE

CHIEF SIGNAL OFFICER OF THE ARMY

TO

THE SECRETARY OF WAR

FOR

THE YEAR 1890.

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REPORT OF THE CHIEF SIGNAL OFFICER.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, October 1, 1890.

Honorable REDFIELD PROCTOR,
Secretary of War:

SIR: I have the honor to submit for the fiscal year ending June 30, 1890, the annual report of the operations of the Signal Corps.

DIVISION OF MILITARY SIGNALING.

The full and complete report of 1st Lieutenant Richard E. Thompson, 6th Infantry, Signal Officer (Appendix No. 1), sets forth the condition of military signaling in the Army.

The Chief Signal Officer is gratified to report a decided improvement in the condition and efficiency of the Army as regards signal practice, which results from several causes, the most potent being the reversion of the policy regarding signal practice which previously obtained, under orders, every month of the year, but which is now confined to two months selected by the Department Commander, who is responsible in this, as in other military duties, for the efficiency of his command.

Signal practice has obtained to a greater extent than for many years, and the records show that no less than 393 officers of the line have been under instruction during the year, representing for the first time in many years every regiment of the Army. It appears that forty per centum of the available officers of the line are either moderately proficient in the transmission of messages by signaling, or have received instruction therein during the past year. At least fifteen hundred enlisted men have been instructed, since during both December and February nearly eleven hundred enlisted men were engaged in practice.

The reiterated recommendations of the Chief Signal Officer regarding the detail of an officer of the Signal Corps as instructor in signaling at one of the great schools of the Army (Fort Riley, Kans.,) have been at length favorably viewed, and at an early date instruction will begin.

Unfortunately no provision has as yet been made for protection against the weather of the valuable field telegraph trains of this Service, but it is hoped that during the coming year they may at least be put under cover, if not made available for instruction purposes.

This division has continued its practice of gathering information as to plans and methods of signaling in foreign countries. The importance of this work, in connection with the collection of kindred information, has been alluded to in a prior report as proper and legitimate duties for the Signal Corps.

By far the most important event in connection with the Signal Corps of the Army has been the unprecedentedly successful establishment and maintenance of an elaborate system of heliograph signaling in the Department of Arizona. The credit for this work deservedly belongs to Assistant Adjutant General William J. Volkmar, who in addition to his staff duties, voluntarily assumed those of the Chief Signal Officer of the Department. Major Volkmar undertook the task of practically testing the scheme of covering, with an inter-related system of helio graph stations, such parts of his department as were of especial military importance. Such excellent judgment, marked energy, and concerted action characterized Major Volkmar's orders and operations as made this system successful far beyond reasonable expectations. The value of this work is not ephemeral, since it consisted not alone in testing the applicability of the heliograph system as a valuable supplement to military movements in the field, but also accumulated, in a graphic and permanent form, a detailed knowledge of the physical conditions of Arizona, which will be valuable in all future military movements or operations in that territory.

Preliminary practice, under Major Volkmar's supervision, was had from April 1st to 10th, 1890, which resulted in the elimination of un necessary intermediate stations, and rendered practicable the establishment of others of greater importance, thus materially extending the system. Concerted practice took place from May 1st to May 15th, 1890, and in view of its great importance to his Corps, the Chief Signal Officer during this period visited southeastern Arizona and southwestern New Mexico, and upon the summit of Bowie Peak was in communication with six different heliograph stations, distant from twenty to seventy-five miles in a straight line, or from thirty to one hundred miles by road. In view of the importance of this work as many heliographs as could be spared, without detriment to other departments, were assembled under Major Volkmar's charge.

About two thousand miles of heliograph lines were operated. Thirty three officers and one hundred and twenty-nine enlisted men and operators took part in this remarkable practice, during which nearly four thousand messages and about one hundred thousand words were exchanged. The regular transmission and interchange of messages were had over greater ranges than have ever before been known in any military practice, or indeed by any methods. Previously seventy-five miles constituted an extreme range for military heliograph work, but in this practice messages were successfully sent and answered over ranges, respectively, of eighty-five, eighty-eight, ninety-five, and communication had at one hundred and twenty-five miles.

In connection with the heliograph practice in Arizona, the Chief

Signal Officer feels it proper to mention Captain C. H. Murray, 4th Cavalry, for the executive ability shown in the arrangement and performance of this novel duty; for his practical skill in devising means for replacing unserviceable parts of instruments; and for his personal participation in the transmission of signals a distance of 125 miles. The following officers should be mentioned as associated in difficult and successful practice at extraordinary distances, viz., Lieutenants George B. Duncan, 9th Infantry, Robert D. Read, jr., 10th Cavalry, Henry C. Keene, jr., 24th Infantry — 85 miles from Baker's Butte to Pinal Mountain; Lieutenants W. H. Hart, 4th Cavalry, A. L. Dade, 10th Cavalry, and M. R. Peterson, 10th Infantry, for 90-mile flash, from Graham to Huachuca; Lieutenants Carl Reichmann, 24th Infantry, Peterson, 10th Infantry, Dade and George E. Stockle, 10th Cavalry, between Lookout Peak and Graham, 100 miles; Lieutenants Wittenmyer, 9th Infantry, Dade, 10th Cavalry, and Peterson, 10th Infantry, for the extraordinary inter-communication between Mount Reno and Mount Graham, 125 miles.

Lieutenant Henry W. Hovey, 24th Infantry, should be noticed for the admirable and successful management, as superintendent of the New Mexico division, of the lines under his charge.

To Lieutenant Read, 10th Cavalry, is due the credit for great energy and practical ingenuity in the establishment of the signal station on Pinal Mountain under difficulties of no ordinary character.

The longest distance at which regular communication has before been had by heliograph is believed to be that between the islands of Mauritius and Reunion, a distance of 117 miles. The Mauritius-Reunion line was a commercial one, with permanent apparatus, costing over $15,000, and having mirrors which displayed upwards of 1,200 square inches of reflecting surface. These data indicate a high degree of skill in manufacture and of deftness in manipulation, whereby the extraordinary work of the Mauritius-Reunion heliograph line has been surpassed by the simple and portable Signal Service heliograph, in use in the American Army, which exposes barely 20 square inches of reflecting surface, costs $40, and proves to be sufficiently powerful for communication at a distance of 125 miles.

THE UNITED STATES TELEGRAPH LINES.

The report of 2d Lieutenant James Mitchell, Signal Corps, in charge of the Telegraph Division of this office, forms Appendix No. 2. A brief description of these telegraph lines, with changes during the year, appears in Lieutenant Mitchell's exhaustive report.

On June 30, 1890, there were sixty enlisted men of the Signal Corps and eighteen civilians on duty in connection with military and sea-coast telegraph lines. Besides regular telegraph duties these men are also utilized in connection with meteorological work. The Chief Signal Officer feels called upon to especially commend the satisfactory service performed by the enlisted men and civilians engaged on this trying duty. These lines, remote from centres of civilization, entail long and monotonous hours of duty every day of the year, including Sundays, as well as more or less physical hardships. The character of the work also renders necessary frequent exposure to severe weather during extended line trips to keep up communication, often endangering health and occasionally even life. The Chief Signal Officer, as far as has been practicable in public interests, has reduced the hours of labor and ameliorated the condition of these operators, which, unfortunately, must be hard, and, still more unfortunately under present conditions, poorly remunerated.

At the end of the year 1,337 miles of military telegraph lines and 621 miles of sea-coast lines were in operation. Lines have invariably been discontinued wherever the extension of railway and commercial lines permit, or in other instances where the lines were no longer required for strictly military purposes. There has been a total decrease of 278 miles in the length of the military lines, while the sea-coast system has undergone no change. Two new lines, aggregating 87 miles in length, were constructed during the year, in order to obtain shorter and more reliable outlets for existing military lines. In such cases the material was recovered from old lines and the work of construction done by troops.

The condition of the sea-coast line between Port Angeles and Tatoosh Island or Cape Flattery, which is of great importance to the maritime interests of the Pacific coast, is unchanged, and it yet remains inoperative. In view of the prospective appropriation for its repair, the station on Tatoosh Island has been maintained under charge of a keeper, at a small expense, pending the late favorable action of Congress.

The entire government receipts from the telegraph lines during the past year aggregated $7,187.24. These moneys, together with those arising from the sales of abandoned lines, have been deposited in the United States Treasury. In addition to government tolls the officers and operators have received and turned over the sum of $11,612.85, being moneys received for tolls over connecting commercial lines.

CORRESPONDENCE DIVISION.

In Appendix No. 3 appears the report on the very extended correspondence of this office, involving the receipt and sending of more than 360,000 communications apart from bulletins, weather maps, etc. As parts of this appendix are lists showing offices inspected, stations recommended for occupancy, and names of meteorological committees which have conferred with this Bureau during the year.

Whenever the exigences of current business would permit, time has been given to completing transcripts of the military history of every officer and man who served in the Signal Corps during the War of the Rebellion. This work is now in an advanced stage, and it is believed that it will be completed during the fiscal year. The great mass of war records is already so methodically arranged that information in case of pensions is invariably completed and returned to the Adjutant General within one working day.

The Chief Signal Officer has special pleasure in commending the zeal, attentiveness, and fidelity of the clerks and other employés in the central office; the occasions having been most rare where inattention or tardiness have happened, and it is believed that the efficiency of the employés is not exceeded by that of any other Bureau under the control of the Government. The attendance of employés at the central office is most creditable, the average absence with leave being 27.7 days, and on account of sickness 5.3 days. The average absence, for all causes, of male employés was 29.7 days, and of female employés 33.4 days.

METEOROLOGICAL WORK.

The civil duties imposed upon the Honorable Secretary of War by Joint Resolution of February 9, 1870, and which by his orders have devolved upon the Chief Signal Officer of the Army, are yearly growing in extent and importance. Apart from the weather forecasts, which are voluntary, not being provided for by law, these duties involve by specific legislation the issuing of storm-warnings; the display on the northern lakes, the Gulf, and sea coast of signals for the benefit of maritime interests; the gauging and reporting of rivers for navigation and flood-warnings; the maintenance and operation of sea-coast lines for the benefit of commerce and navigation, and of interior military lines for the use of the Army; the reporting of temperature and rainfall conditions for the cotton interests; the display of frost warnings in the interest of agriculture, and the notification of advancing cold-waves for the benefit of the general public.

WEATHER FORECASTS AND STORM WARNINGS.

The issue of these warnings has been uninterrupted throughout the year, and such promptness and regularity have only been possible through the continuity and efficiency of telegraph service on the part of the Western Union and other telegraph companies.

It is justice to the Western Union Telegraph Company (which corporation necessarily handles nine-tenths of the weather reports of this Service), to state that the pending controversy, regarding rates of compensation, has in no wise affected the efficiency of the telegraph service rendered. In no previous year have the circuit reports been handled with more accuracy and speed than at present, while the special service—save in very few cases, which have received the prompt attention of the executive officials of the company—has been most satisfactory and free from undue delays. In cases of serious interruptions to telegraph circuits, the company has invariably placed its last wire at the service of this Bureau.

Applications asking special predictions for cities have been so numerous that the overworked Forecast Official cannot furnish such regularly. The office, however, always furnishes special predictions on occasions of public importance. The impossibility of accomplishing additional work of this character is shown by the fact that the average time at the disposal of the Forecast Official for the discussion and formal issue of weather forecasts is forty-nine minutes in the morning and fifteen minutes more at night.

The duties devolving personally on the Forecast Official, in this limited time, permit less than one-quarter of a minute on an average in which to decide, formulate, and express a forecast for a state or district regarding any meteorological element, such as weather, temperature, and wind. Rarely can a minute be given to the predictions for any particular state or district. This time limitation forbids for an entire state anything but a forecast of a general character, while again the variety of weather conditions in large areas often precludes the possibility of briefly announcing them, even in summarizing and much less in forecasting.

With a view of subserving the public interest by local forecasts, the Chief Signal Officer has initiated the plan of permitting officers and observers in charge of stations outside of Washington City to make local forecasts of weather and temperature. A conservative course has been followed, and in no case has an officer or observer been authorized to make such forecasts except on application and with the recommendation of the Stations Officer. At present the observers in charge of 31 stations are authorized to make forecasts both for weather and temperature, and at 55 others they predict the weather only. This plan has so far been received with general favor and met with such success as to warrant the continuance and gradual extension of the system. Observers issuing maps publish, under proper caption, the local predictions made by themselves, as supplementary to the official forecasts.

The local press in the great cities of the country, and occasionally in smaller places, has appreciated the public interest in local forecasts, and has, in a number of cases, employed a meteorological editor who, furnished with the data of the Signal Service, has enlarged on the general synopsis of this Bureau, and supplemented them by definite and satisfactory local forecasts. These meteorological editors of ability have put forth their forecasts not only in an agreeable form, but, thoroughly familiar with local needs, in such shape as local business interests demanded. The value of such supplementary work cannot be overestimated, since millions of readers of these great metropolitan dailies never see the regular data issued by this Service. Among the many great journals which so largely contributed climatological and meteorological data of local interest, may be particularly mentioned the "Boston Globe," "Boston Herald," "Cincinnati Commercial-Gazette," "Chicago Inter-Ocean," "Chicago Tribune," "Detroit Journal," "Galveston News," "New York Herald," "New York Sun," "New York Tribune," "San Francisco Chronicle," and the "Saint Louis Globe-Democrat."

The predictions from Blue Hill Observatory, confined to Boston and vicinity, have been continued through the liberality of Mr. A. Lawrence Rotch.

The report upon the percentage of verification of official forecasts for twenty-four hours, issued daily at 8 a. m. and 8 p. m., made by Assistant Professor C. F. Marvin, forms Appendix No. 4. As has been stated before, this professor is in no way associated with the forecast officials in their special work, and consequently his judgments are free from the suspicions of bias which might have arisen under the system of verification formerly in vogue.

The percentages of successful forecasts (stated in detail in Professor Marvin's report) are 84.4 for weather, 78.7 for temperature, and 82.6 as a general average. During the year 1,112 storm signals have been ordered, of which 1,040 have been justified as to direction; 695 justified wholly as to velocity, and 59 partly as to velocity. The accuracy of weather and temperature predictions has increased 1.7 per cent. over the previous year; that of storm signals remains practically the same as last year, 67.1 per cent.

Long time forecasts of weather and temperature have been issued at the discretion of the forecast official, with successful percentages of 81.6 for 48 hours and 80.5 for 72 hours. These forecasts are made not for small areas, but for extensive sections. Those for 72 hours in advance were somewhat infrequent, there being but 146 made during the year; those for 48 hours were quite frequent, and in number reached 1,833.

The following officers have performed the difficult and arduous work of forecasting: Captain James Allen, 3d Cavalry, during the months of September, December, and March; Captain H. H. C. Dunwoody, 4th Artillery, during August and January; 2d Lieutenant W. A. Glassford, Signal Corps, during February and May; Assistant Professor H. A. Hazen, during October and June; 1st Lieutenant R. E. Thompson, 6th Infantry, during July, November, and April; 2d Lieutenant J. E. Maxfield, Signal Corps, for the Pacific coast region, during the entire year. The detailed standing of these officials appears in Appendix No. 4. There is a difference of 6 per cent. between the general average of the least successful (79.8) and the most successful (85.8) official in forecasting weather and temperature. The most successful forecaster is the official having the longest experience in this class of work. As has been pointed out in previous reports, special qualities of mind are essential for successful work of this character; but, in addition to natural aptitude, experience is necessary, and it must inevitably follow in the future, as it has in the past, that the introduction of a new forecast official means temporarily a less degree of success than ordinarily obtains.

COLD WAVES.

The Chief Signal Officer pointed out in his last annual report the necessity which devolved upon him of training some single official in the important duties of forecasting advancing cold waves. In view of the probable elimination at an early date of military features from the Weather Bureau, the Chief Signal Officer believed it incumbent upon him to devolve duties of this and kindred character, as far as might be possible, upon the civilian assistants of the office. In pursuance of this policy, Assistant Professor Thomas Russell was directed to investigate and study this class of phenomena, and shortly after, eighteen months since, was assigned to the work of forecasting. As was stated last year, the premature assignment of Professor Russell to this duty was necessitated by the unexpected loss of an experienced official.

It inevitably followed that Professor Russell worked at a considerable disadvantage from lack of practice. He also labored under the further disadvantage of restrictions thrown by the present Chief Signal Officer around these predictions, which had formerly been treated and verified with a leniency too great for the public good. In prior years percentages had been dependent only upon cold waves actually forecast. Besides, no time limit was placed upon the display, and no penalty was attached to failure to forecast, no matter how severe or sudden the cold, nor how serious the resulting damage.

The percentage of verifications (55) relates to the cold waves forecast under the present rigid rules, but to this might be added, in comparison with preceding years, 14 per cent. of other waves which would have been verified under previous rules. Professor Russell has pursued a most cautious course in displays, as cold waves occurred, counting the stations separately, on 723 occasions, yet there were but fourteen occasions on which severe cold waves were not predicted; in other words, 98 per cent. of all the important waves were forecast. Meantime Professor Russell has devoted his energies to an elaborate investigation of the scientific methods essential to the successful prediction of cold waves, which study, being of great value and bearing upon current work, forms part of his report. These investigations terminated too late to be of practical benefit in the work of the past winter, but it is believed that they furnish a groundwork upon which Professor Russell will rear a superstructure of successful predictions satisfactory to the country at large. This report forms Appendix No. 5.

RIVERS AND FLOODS.

Professor Thomas Russell, in addition to his duties as forecast official of cold waves, has remained in charge of the River and Flood Service of this Bureau. His report, which forms Appendix No. 6, is not only of interest in connection with the current work of the past year, but also for its general account of the disastrous floods which devastated many thousand square miles of the lower Mississippi valley during the spring of 1890.

Observations of the heights of rivers are made at seventy-one places on twenty-seven rivers, and, as supplementary to these, forty-seven rainfall stations, located near the headwaters of the most important tributaries of the great rivers, have been maintained, speedy and accurate information of heavy rainfalls at these points being essential to the successful forecasting of river rises.

The very limited appropriations at the disposal of this Bureau have prevented the establishment of additional stations, except of the river at Terre Haute, on the Wabash, and of rainfall at Rome, Ga., and at Arkadelphia, Ark. The appropriations have been insufficient to maintain daily observations throughout the year at important stations or to enable reports to be made for any portion of the year for the benefit of the various communities along the Alabama, Coosa, Tallapoosa, and Savannah rivers. The increase of $4,000 in the appropriation for the coming fiscal year will enable the Chief Signal Officer to establish nine additional river stations in Alabama and Georgia, and possibly one or two at important points on the upper tributaries of the Ohio, which river is the most important in its bearings upon the great and recurring floods which bring such disaster to the central and lower Mississippi valleys. Even with the establishment of these additional stations, there is situated below Saint Louis, Cincinnati, Chattanooga, and Nashville, a drainage area of over one hundred thousand square miles, whose waters pass Cairo without this office, under the present system, being able to determine their amount in advance.

Professor Russell has investigated the river data of the past year with a view to predicting stages of water by systematic method. The results of his investigations regarding the Ohio River, which is the great flood gatherer, appear in Appendix No. 6.

He strongly urges an additional appropriation of $4,000 for the purpose of gauging the Ohio River at various points. In no other way will it be possible to accurately determine the effect upon the river produced by any given rainfall in any given drainage basin.

The great event of the year, in connection with the river service, was the flood of March, April, and May in the lower Mississippi valley. The warnings issued in advance of these very destructive floods were ample as to time, beneficial as to results, and, in all, most creditable to Professor Russell's judgment. As early as March 1, 1890, a warning bulletin was issued to the public, setting forth that the river at Vicksburg would by March 14th rise to forty-nine feet, a point which approximates the highest water that ever prevailed. On March 15th, one day later than was forecast, the Mississippi River attained at Vicksburg a height within twelve inches of that predicted, and would doubtless have reached the point forecast but for crevasses above Vicksburg. On March 12th a general flood warning was issued, stating that the lower Mississippi valley would be inundated by a flood closely approximating the greatest overflow that had ever occurred, and all parties interested were warned to secure movable property above the highest flood stages known in the various localities. Similar special and urgent bulletins were issued on the 27th of March and April 7, 1890, which warnings were amply confirmed by the excessive and disastrous floods which followed. Despite the enormous areas (aggregating nearly a quarter of a million square miles), over which the rainfall had to be estimated, the flood predictions of this year, relative to the Mississippi, attained an accuracy approximate to the flood forecasts for the Seine at Paris, France. It must be remembered, however, that the predictions for Paris pertain to a drainage basin of only twenty thousand square miles, while those for the lower Mississippi covered over one and a quarter million square miles. Again, predictions for Paris are three days in advance, while those for certain portions of the Mississippi were made from seven to fourteen days prior to the dangerous and destructive stages. The data available in the Seine drainage basin is about ten times as much as those which obtain in the drainage area above Cincinnati, which drainage area is four times greater than that of the Seine. With the establishment of a small number of additional stations and a proper investigation of the river outflow in relation to gauge readings, Professor Russell expresses the opinion that as accurate predictions three days in advance could be made for Cincinnati as are now made at Paris.

HURRICANE REPORTS.

The Chief Signal Officer regrets to say that the weather reports from the West Indies, resumed in 1889, through the courtesy and energy of Mr. Luis E. Carbonnelly, Director of the Naval Observatory at Havana, Cuba, have not been as regular and full as could be desired. The service was largely voluntary, and the failure in this respect is in no way due to Mr. Carbonnelly, whose energy and interest in this work continue unabated. The Chief Signal Officer deemed it necessary, however, to take steps calculated to secure the prompt receipt, during the hurricane season at least, of reliable reports from observers in the West Indies at four of the most important points formerly occupied by this Service. Near the end of the fiscal year, the Chief Signal Officer was happily assured of the valuable co-operation of the Secretary of State, from whom assurances have been received that the United States consular officers at these points will take an active interest in securing reliable and faithful observers. Such other steps have been taken as will insure in this and coming seasons the receipt of these invaluable reports.

Father Benito Viñes, S. J., Havana, Cuba, has continued to furnish, at an expense to this office for telegrams only, his opinions and predictions relative to the position and the probable advance of hurricanes. The Chief Signal Officer is pleased to be able to acknowledge the ability and zeal of Father Viñes, who has always, freely and gratuitously, placed his valuable services at the disposal of this office.

WEATHER MAPS.

The methods of dissemination of meteorological information, whether in the shape of forecasts, semi-daily charts, regular or special bulletins, are, in the order of importance, as follows: 1st, through the Associated Press and other press organizations; 2d, through the metropolitan newspapers; 3d, by distribution from selected service stations, by telephone, special messenger or mail; 4th, by telegraph to the superintendents of important railways, who in turn distribute them by telegraph to their operators that they may be posted for the public benefit; and 5th, by telegraph to voluntary stations displaying weather signals.

During the past few years the relations of the Weather Bureau to the general public have materially changed, and, happily, in a direction indicating not only the interest of the American people in this work, but also that characteristically high degree of intelligence which has enabled hundreds of thousands to acquire rapidly and incidentally a cursory knowledge of the principles of weather forecasting, a science which was for a long time assumed to be beyond the ken of ordinary folk. In the early years of the existence of this Bureau forecasts were received with a disposition to implicit confidence and a leniency of judgment, which, fortunately for the future of meteorology, no longer exist. In noting the remarkable advances made by the general public in knowledge of meteorology, the Chief Signal Officer has attempted to supplement that indispensable adjunct as a means of information—the press of the country—by disseminating in graphic and simple manner the detailed meteorological information collected by this Bureau. In undertaking this work it was early evident to the Chief Signal Officer that the legitimate demands of the public, with the present limited force and appropriations, could only be met by improved methods of duplication, and by a most economical administration. A policy was adopted, wherein liberality in some directions and restriction in others have been combined as far as possible. Officers and observers have been invariably enjoined in distributing these maps to avoid carefully any encouragement of the idea that these maps could be had by every applicant. The Chief Signal Officer believed that if the circulation of these maps was stimulated, such course would eventually prove not only an embarrassment to the Service, but a decided injury to it; as it was evident that at an early period the maps issued to parties who originally sought them for curiosity or a transient personal interest, would, when a genuine interest had been awakened, be necessarily discontinued in order to supply the growing demands of considerable bodies of the general public. The methods followed in their preparation and issue are described in detail in the report of the Stations Officer, Appendix No. 7.

The rule was adopted of regularly displaying the 8 a. m. and 8 p. m. maps, posted in neat and appropriate frames furnished by this Bureau, at every post-office in towns of considerable size which could be reached by letter mail in seasonable time from the great railway centres of the country, such as Atlanta, Boston, Chicago, Cincinnati, Galveston, Harrisburg, Kansas City, Louisville, Nashville, New Orleans, New York City, Philadelphia, Saint Louis, Saint Paul, and Sioux City. In addition to displays thus made in prominent post-offices, these daily charts are distributed gratuitously to boards of trade, chambers of commerce, prominent clubs, posted in the principal public buildings, and also at such establishments as from the character of their business would largely profit by them, or, as from their location, are frequented by a considerable number of the general public.

There have also been frequent applications, which have always been favorably considered, for weather charts by professors and instructors in colleges and high schools of the country, where they have been used as current and striking illustrations of nature's forces, which thus impress upon the youth of the nation the importance of intelligent study of physical phenomena. In some schools daily weather forecasts have been regularly made, based on the data of current charts, so that the minds of the pupils have been more strictly impressed with this subject than could have been otherwise possible. The use of weather maps as supplementary text-books has neither been local nor limited, as is evident from the fact that during an appropriate part of the school season these charts have been regularly and gratuitously furnished at 29 stations to 130 colleges, schools, and educational institutions.

The demands for daily weather charts have increased to a remarkable extent, and their use for general display and in public institutions is so great that only in rare and exceptional cases has this Bureau found it possible to issue these maps gratuitously, despite the fact that hundreds have applied for them. In 218 cases where the interests of the public service have prevented the Chief Signal Officer from issuing them for personal reasons, the parties have deemed them of sufficient importance to ask for them under Section 227, R. S., authorizing their sale, and to pay the subscription price of 2 cents per copy.

The astonishing growth of the Service in this respect, though strictly healthy and in no way fictitiously fostered, is evidenced by the following statement showing the copies of weather maps issued:

	1886-'87	1887-'88	1888-'89	1889-'90
At Washington City	126,000	117,750	175,000	193,140
At other stations	52,248	274,411	683,947	876,394
Total	178,248	392,161	858,947	1,069,534

It will be noted that the increase in the issue of these maps at Washington City, the central office, has been 53 per cent. in the past four years, an increase which corresponds closely to the general increase in the general work of the Bureau for the same period, being about 11 per cent. annually. But outside of Washington City it is remarked that the number of maps issued has increased from 52,248 in the fiscal year ending June 30, 1887, to 876,394 in the fiscal year ending June 30, 1890, or nearly seventeen times as many in 1890 as in 1887. As indicating the change in distribution, it appears that the relation of maps issued at stations outside of Washington City to the whole issue has increased from 35 per cent. in 1887 to 82 per cent. in 1890.

WEATHER SIGNALS.

There were 1,018 points, not within timely reach of maps by mail, supplied with telegraphic forecasts and warnings at Government expense at the end of the year; the displaymen continuing, as before, to furnish the flags, pay for the delivery of the telegrams, and make the display of the signals for the public benefit without expense to this Service, thus furnishing conclusive evidence of the value generally attached to these displays.

REVIEW DIVISION.

The Monthly Weather Review has been regularly published. It not only serves the legal purpose of tabulating the current observations so as to enable the officials of this Service to preserve and discuss the meteorological data from month to month in connection with the current work of the Service, but it also answers as the means of acknowledging and preserving the observations of the volunteer meteorologists of the country, who receive no other return.

In addition to the regular meteorological data, the Review contains descriptive accounts of the West India hurricane of September 3 to 12, 1889, the tornadoes of March 27, 1890, and an annual mean summary of the climatological conditions of the United States, for 1889, as regards pressure, rainfall, temperature, and winds.

This office has also continued, as in the interest not only of the world in general but of the meteorological work of the United States, the task of tabulating and charting such meteorological data as are received from international co-operating services and observers, and as show the monthly and annual mean pressures, and wind force and direction.

WEATHER CROP BULLETIN.

The Weather Crop Bulletin of the Signal Service has been regularly issued during the year, this being a monthly publication during the winter months and a weekly bulletin during the growing season from March 1st to October 1st. This bulletin contains a weekly summary of the temperature and rainfall, based upon reports from telegraphic stations, and a comparison of the same with the normal conditions pertaining to the current week, and also for the entire season from January 1st to the date of issue. It also contains general remarks, based upon telegrams forwarded from the central stations of state services, as to the effect of week's weather upon the growing crops. These telegrams are based upon reports received from numerous observers throughout the state, submitted in time to reach the state centre by Saturday morning; so that the weekly bulletin presents a reliable summary of the meteorological conditions and the effect of the same upon the principal crops throughout the agricultural regions of the United States. This bulletin is also accompanied by a tabular statement containing the data upon which it is based. Both are issued and mailed on Saturday night in time to reach the principal commercial centres before the beginning of trade on Monday morning. This general bulletin is locally supplemented by the weekly bulletins issued by the state weather services, each service preparing its bulletin, based upon mail reports.

There is no feature of this Service which has met with such universal favor, and been so highly valued, as the Weather Crop Bulletin. It has been commended by boards of trade in the wheat and cotton regions; it is regularly telegraphed as an item of news by the press associations; is very extensively published by the principal journals of the country, and is also cabled regularly to Europe. Considered in connection with the local state bulletins, it places before the people of the country, at weekly intervals, a reliable statement as to current and seasonal weather conditions, whether normal or abnormal, and as to the effect and extent of such weather conditions on the staple crops. This information has been extensively and advantageously used by both producers and dealers, and its date of issue, Saturday, places both on an equal footing. The local crop bulletins are exchanged and each board of trade is also supplied with all state bulletins throughout the cotton region, for the benefit of its members.

There are also prepared, from the data of the Weather Crop Bulletin, charts graphically representing the excess or deficiency of temperature and rainfall throughout the United States. These charts, prepared weekly, are supplied to the Superintendent of the Marine Hospital Service, who includes them, with a tabular statement, in the weekly abstract of sanitary reports issued by the Marine Hospital Service. The first issue of these charts occurred on April 11, 1890, and they have been continued without interruption since that date. They present the conditions of temperature and moisture in such a form as to render it possible to readily study these conditions in their relations to such special diseases as prevail over any extensive area.

FOREIGN WEATHER SERVICES.

The co-operation of the Chief Signal Officer with Professor Mascart, Director of the Central Meteorological Office, Paris, France, has continued throughout the year. Each night a cablegram is sent to Professor Mascart, at Paris, summarizing the synchronous meteorological observations, gales, derelicts, and dangerous ice of the western Atlantic for the previous five days, together with the current weather conditions of the United States. This information is highly appreciated by the Central Meteorological Office of France, which utilizes it for making its own forecasts, and is also valued by all shipmasters, who profit by early and detailed information as to fogs, ice-fields, and wrecks, whereby their western courses from England and France may be made with greater safety and speed. The Chief Signal Officer acknowledges the continued hearty co-operation of the Hydrographer of the Navy, under whose orders valuable ocean data have been regularly furnished this Bureau. Credit is also due to the "New York Herald" ocean weather service for similar voluntary meteorological data.

STATE WEATHER SERVICES.

Captain H. H. C. Dunwoody, 4th Artillery, Signal Officer, has remained in charge of the duties pertaining to State Weather Services and meteorological societies co-operating with the Signal Service; his detailed report forms Appendix No. 8. There are at present twenty-eight services, covering thirty-three states—the jurisdiction of the New England Meteorological Society including six; ten services have been organized by legislative enactment and receive support from state governments.

The Chief Signal Officer has continued towards these services a policy of liberal and hearty co-operation. He has always refrained most carefully from any effort to influence the line of work of these organizations, since he realizes that the state and National Services work under differing conditions, though on either parallel or converging lines of research. The able administration and high scientific standing of directors in charge of state services are matters of congratulation. They conduct the affairs of their own organizations after their own policy, without intruded suggestions.

There are 26 observers of this Bureau performing duty in connection with state services; and in selecting men for this important work special endeavor has been made to detail observers of liberal education and with extended meteorological experience.

The assistance rendered to the local services by the detail of Signal Service observers as assistants to the directors has been recognized as an important feature of the co-operating work of this Bureau with the state services, as it brings to the aid of the directors men whose education and experience qualify them not only to render valuable assistance in selecting stations and instructing observers, but also in tabulating the data and in preparing the reports.

The Chief Signal Officer appreciates the importance of these services to the different states, in concentrating and applying to the benefit of local interests climatic data pertaining to their immediate section of the country. The value of these organizations has been acknowledged and made evident, particularly in New England, New York, Pennsylvania, and Michigan, where these services have published valuable data at their own expense. In some cases these publications have set forth the normal climatic conditions, and in others have appeared special memoirs on subjects pertaining to general meteorology, which investigations cannot fail to be of value to the country at large and to the National Service in particular.

It appears evident, however, to the Chief Signal Officer that a sharper line than now exists must be drawn relative to state services aided by the National Service, and in consequence he has decided to withdraw aid, after January 1, 1891, from such services as are unable to print for the benefit of their state the observations accumulated and tabulated by the Signal Service assistants. As has been stated in a previous report, state services, which are only branches of the National Service, must be of limited utility.

STATIONS DIVISION.

The meteorological force throughout the country has remained under the direct supervision of 2d Lieutenant James Mitchell, Signal Corps, whose report forms Appendix No. 7. Lieutenant Mitchell's long and practical experience in the details of work performed at the local offices, and his knowledge of the personnel of the Service, have rendered his administration of station duties most satisfactory. His report contains matters of importance and interest bearing on the work done, the methods followed, and the various changes made in the directions of economy and efficiency.

Until 1888 there was only one first-class meteorological station under control of the Chief Signal Officer. On June 30, 1890, there were twenty-six such signal stations in the United States, at which the most important meteorological phenomena are now continuously recorded by means of self-registering instruments. Five hundred meteorological stations of all classes were in operation on June 30, 1890; of these, 144 are meteorological stations taking two or more observations daily; 34 auxiliary meteorological stations taking a daily observation; 15 repair stations on United States military telegraph lines; 73 special wind display stations; 72 special river stations; 46 special rainfall stations; 114 cotton-region stations; and 2 state weather service stations. At all these stations, except those for the display of wind signals, in addition to various other duties (such as operating or repairing telegraph lines, the observing of river heights, or the performance of duties in connection with state weather services) the observers also record daily the amount of rainfall and the maximum and minimum temperatures. The special duties performed at these stations are set forth in detail in Appendix No. 7.

RECORDS DIVISION.

The very valuable reports of 2d Lieutenant William A. Glassford, Signal Corps, who has been in charge of the Records Division during the greater part of the year, form Appendixes Nos. 9 to 17.

The enormous extent of country covered by the voluntary and regular reports of the Signal Service, and the complicated inter-relations of the various meteorological and climatological data, combine to make the proper collation of these data, in their bearings upon industrial, commercial, and other questions, a subject of great difficulty. Every effort is being made on the part of this Bureau to utilize in the public interest the vast amount of meteorological data which have accumulated during the past nineteen years; and it is hoped that the arrangement will soon be so complete and comprehensive as to permit the speedy application of observed facts to the solution of any climatic question in which the public interests, or any considerable number of the American people, are concerned.

Meteorological reports to be valuable must be correct, not only in observation, but in reduction and tabulation. It is only within the past two years, however, that the data used in current publications have been rigidly examined prior to their dissemination. The pressing demand for early publication has in prior years been the proffered excuse for the non-examination of current meteorological reports, but the systematic methods introduced at the central office in late years practically established the soundness of the theory that the examination of data prior to current use consumed no more time or effort than a similar examination after publication, and really in the end involves less labor, since in subsequent careful investigations errors have to be eliminated and corrections duly made. This work of examination is a task of no light magnitude, since more than 10,000 reports are received and scanned monthly.

The standard of accuracy among the regular observers in the Signal Service is very high, and it is gratifying to report that during the past year there has been a decrease of about 15 per cent. in the number of errors found in the more important forms. The publication of commendatory notices of the most skilled and accurate observers, and the censuring of those who fall below a certain standard of efficiency, have contributed to this marked improvement.

The important labor of systematic arrangement of the loose reports, and the proper assemblage in bound volumes of the more important, has been continued as opportunity offered. About 100,000 of such forms and reports have been appropriately arranged, bound in 757 volumes, and indexed during the year. A systematic assemblage of the most valuable bound and unbound records in the fire-proof vault, provided for by Congress for that purpose, has been attempted during the year. Unfortunately further work in this direction is impracticable, owing to lack of suitable shelving. The temporary wooden shelves, constructed before the vault could be occupied, have proved insufficient in quantity and faulty in construction. A considerable number of the shelves have broken down upon the records below, necessitating temporary and insufficient expedients in connection therewith. It appears evident that a fire-proof vault for important public records should be fitted up with metal shelving, and a necessary appropriation therefor of $2,800 has been incorporated in the estimates for the contingent expenses of this Service. Until proper shelf room is obtained it is impossible to re-arrange or change the capacity of any single shelf without removing the contents of a whole section and practically rebuilding it.

There have been 588 demands upon this office for meteorological information during the year, which have been acceded to, while the Chief Signal Officer has been obliged to refuse other applicants who desired extended data beyond the power of the current force to furnish, or refer them to the incomplete official reports for the past nineteen years.

In special instances, where the transcripts were of an extended character and wholly in private interests, excerpts have been made, out of office hours, at the rate of forty cents an hour, and at the expense of the parties to be benefited. There have been 20 such transcripts, involving the sum of $37.40. The Chief Signal Officer views such paid work with disfavor, but since these transcripts could not be furnished in regular hours without interfering with regular work, has reluctantly deemed it best to allow such work in special cases.

The transcripts furnished are not only used as evidence in courts, for publication with matters of public interest, and for scientific research, but have been put to practical use in connection with commercial enterprises, and utilized in connection with medical and other professional matters of decided economic importance. Among the valuable and suggested lines of investigation may be mentioned that ably discussed by Mr. Edward Atkinson, of the New England Cotton Manufacturing Association, October 30, 1889, bearing upon the predominating influence which the relative humidity of the country exercises on the successful operation of cotton manufactures. A similar line of inquiry, with respect to conditions of temperature and relative humidity needful for the successful production of flax and hemp, was instituted at the request of the Hon. R. M. La Follette, M. C., member of the Ways and Means Committee of the House of Representatives. These researches illustrate the important relation of climatological conditions to the wealth and prosperity of this continent. In these days of stimulated production and excessive competition local climatological peculiarities may prove a source of prosperity, or when accurately determined, may, under unfavorable conditions, be hardly less beneficial in forecasting and avoiding disasters, which in either case would flow from the prosecution of enterprises, industries, or cultivation peculiarly suited to, or unfitted for, the region in question. Detailed inquiries, relative to climatic conditions for purposes above stated, and as to their salubrity or insalubrity relative to certain diseases, are frequently made of this Bureau. Doubtless some applications are due to the fact that climatic data pertaining to health resorts throughout the country have naturally a biased coloring, arising from the treatment of climate from a local rather than from a general standpoint, so that in case of conflicting claims the official records of this office are sought in confirmation.

The importance of accurate information as to local climatic conditions is of value to many invalids of the country, but the benefit is particularly great to the poorer classes, who can ill spare the expense of travelling, not to mention the impairment of health and strength while in search for climatic conditions conducive to their restoration.

The most important compilation made by this division, apart from the preparation of current data for discussion and publication, has been the report of the Chief Signal Officer to the United States Senate, made in answer to a resolution dated April 22, 1890, on the climate of the State of Nebraska.

At the end of the year, the Records Division was engaged in an extensive report on the climatology of the arid region, in answer to the resolution of the House of Representatives dated May 23, 1890, which it is hoped will be submitted at an early day.

Attention is invited to the resumé by Lieutenant Glassford in his report, of the work done and progress made in meteorological records since the first system of regular and continuous observations in the United States was instituted at the suggestion of Surgeon General Ruggles of the Army in 1819. In all meteorological systems of this country the Army of the United States has been the pioneer in work of meteorological observation, and, from whatever standpoint the question is viewed, the accumulated data resulting from the careful and devoted labors of officers and men at hundreds of isolated military posts form a comprehensive network, filled in by the reports of the intelligent voluntary observers of the country, which for some years to come must be accepted as the groundwork of American meteorology

The Chief Signal Officer has pleasure in acknowledging the continued valuable co-operation of the Medical Department of the Army, which has furnished regular reports from 119 military posts, situated in isolated and sparsely-settled regions where meteorological data are most scanty. This number represents an increase of twenty-four over the preceding year, and as to their reliability, it is proper to state that under the present careful and interested supervision of the Surgeon General of the Army the reports from the Medical Department are of a higher order of accuracy than ever before and show, as a rule, great care on the part of the medical officers in charge.

As part of Lieutenant Glassford's report appears a list showing the number of voluntary and other co-operating observers in the different states and territories, aggregating 1,924 on June 30, 1890.

It gives the Chief Signal Officer pleasure to note the fidelity of action and generous spirit of scientific co-operation shown by the voluntary observers, both men and women, who daily, for many years, give gratuitously their time and attention to the recording of facts which increase the sum of human knowledge. The Chief Signal Officer has recognized as far as possible on his part, in an inadequate way, however, the labors of the voluntary observers, by regularly sending to them the "Monthly Weather Review" and his annual reports.

An erroneous idea occasionally appears to the effect that these local observations benefit wholly the Weather Bureau and that on them the forecasts of the weather are made. The fact, however, is that these reports are received from one to three weeks after the end of the month to which they pertain, and that their value is almost entirely climatological—that is, they are of value in enabling this office to chart, for the benefit of the whole country, more accurately and fully the existing rainfall and temperature conditions. Ultimately the data from voluntary observers, when collated and published by this Bureau, are of decided benefit to the regions to which they pertain, this being especially applicable to the trans-Mississippi country. These reports enable this office to put before all interested in agricultural operations, charts and tables indicating with great accuracy the dates of the first and last killing frosts, the first and last snows, length and severity of winters, frequency of cold waves, and the duration and intensity of droughts and heated terms. Climatological data, systematically collated, are of marked benefit to the department of medicine, and it redounds to the benefit of the section concerned by attracting thereto that class of invalids, or semi-invalids, whose physical conditions are such as to render a special climate necessary for their health and strength. The fostering of local observations in the interest of medicine obtains in the states of Michigan, Tennessee, and Colorado, where the study of climate as affecting health has been prosecuted in a systematic manner, especially in the state first named, under Dr. Henry B. Baker. The value of local observations is especially evident to corporations planning traffic lines or enterprises of extensive scale, in what may be called the comparatively unknown sections of the United States. In these matters the probability of extreme weather, as well as the average conditions, is often knowledge of marked value. In more limited areas local climatic records are important factors, especially in matters of rainfall in limited catchment areas, which may affect public works, not only when canals, storage reservoirs, or irrigation ditches are in question, but also sewers, drains, and other sanitary engineering works essential to the health of great cities.

The Chief Signal Officer especially acknowledges the courteous cooperation of the Hydrographic Office of the U. S. Navy Department;

of the Geological Survey of the Interior Department; of the officers of the Central and Southern Pacific railways, and of the "New York Herald" weather service. From the Geological Survey has been received an average of forty-eight rainfall reports, principally from Arizona, Colorado, and New Mexico, made by the observers of that survey, in connection with the irrigation projects in the arid regions. From the Hydrographic Office has been received an average of 327 reports each month, but, owing to the change of vessels and commanders, these reports pertain to 892 different vessels. From the "New York Herald" service, whose valuable co-operation is especially recognized, this Bureau has received a monthly average of 45 reports made by captains of 123 different vessels.

For the past twenty years the Central and Southern Pacific railways have made monthly observations of temperature and precipitation, and since 1877 have furnished them to this office. The foresight and enterprise exhibited by the officers of these roads have resulted in the accumulation of data which make the sections through which the lines pass better known climatologically than any other parts of the country west of the 100th meridian. These reports have been regularly furnished through the past year from 188 stations. It is evident that the comparatively small outlay by the Central Pacific Railway in 1870 for thermometers and rain-gauges has been a most profitable investment. Not only have exact weather and temperature data enabled the company to successfully resist unwarranted claims for damage and demurrage, but such data have placed the intelligent managers in a position to forecast and forestall disastrous weather conditions in some instances and to take advantage of favorable conditions in other cases.

As will appear from Lieutenant Glassford's report, the co-operation of voluntary observers is not sectional; there being no state or territory from which this office does not receive data. The largest numbers received monthly are from Colorado, 207; Michigan, 106; and Kansas, 102.

In cases where such action has been necessary to secure voluntary reports, instruments, such as rain-gauge, exposed thermometer, and maximum and minimum thermometers, have been issued to observers, who give a personal bond to the office for the proper preservation and return of the instruments when called for, and who agree to make regular reports of the temperature and rainfall. The occasions have been rare in which the observer has not carefully and conscientiously complied with the terms imposed. The distribution of these instruments has largely been in the trans-Mississippi country, the greatest number issued being as follows: in Texas, 143; California, 161—in all, 1,871 thermometers and rain-gauges have been issued, nearly one-half, or 882, during the past year.

The preparation of a card index of the stations in the United States at which meteorological observations have ever been taken, has been continued as opportunity offered throughout the year. When finished these indices will afford an accurate and comprehensive history of all climatic observations ever made in this country. The number of cards now prepared is 4,304; the grand total will exceed 6,300.

Supplementary to the card catalogue, there is now being compiled an index for each state of all observations ever made within that state, the intention being to prepare a sufficient number of these indices, by the milliograph process, for distribution to the Signal Service observers serving at the most prominent station in respective states. Thus far 61 pages of the index have been completed, embracing the following states and territories: Alabama, Alaska, Arizona, Arkansas, California, Colorado, Iowa, Louisiana, Minnesota, Missouri, Nebraska, Nevada, New Mexico, Utah, and Wisconsin. The indices for the whole country will be finished during the fiscal year of 1891.

INSTRUMENT DIVISION.

Assistant Professor Charles F. Marvin, in Appendix No. 18, reports upon matters bearing on the instruments of this Service, whether relating to their supply, exposure, repair, or correctness.

It is due to Professor Marvin to say that the general standards of instrumental correctness have steadily improved, and the equipment of the meteorological stations of this Service is now at the highest point of excellence, and as a whole is second to no meteorological service extant. Careful supervision has been exercised over instruments in use, and the various stations have a completeness of equipment and a uniformity of exposure never before obtained in this Service. The great advantage of continuous records of wind, temperature, rain, sunshine, and atmospheric pressure, by automatic or other method, has been fully recognized by the scientific world. The United States has been hitherto derelict in this respect as to its meteorological stations. The Chief Signal Officer has the past year given his personal attention to this matter, and under Professor Marvin's systematic labors and investigation the signal offices of the United States soon bid fair to be unequalled, as a whole, in the number, simplicity, and satisfactory workings of their self-registering instruments. Until 1888 there was in this Service only one city (Washington) equipped with self-registering instruments, but at the date of this report twenty-five of the most important meteorological stations in the country are now 1st-order stations, having automatic instruments of precision. Steps are being taken to fully equip twenty-five additional stations, at which two or more self-registering meteorological instruments are now in position.

The self-registering records of pressure, temperature, rainfall, the direction and velocity of the wind are not allowed to depend alone upon the records of the automatic instruments, however perfect they are considered, but are regularly checked by at least semi-daily eye readings of the standard instruments.

Improvements and modifications in the manufacture, exposure, and management of various instruments, and the special devices adopted, are noted in Professor Marvin's report. Among other improvements introduced at some of the important stations of the country are the furnishing of suitable cases for the protection of mercurial barometers, and of instrument stands specially devised with reference to the proper setting up and convenient management of self-recording instruments. Important improvements have been made in the combination-exposure of wind-vanes and anemometers.

In connection with the West Indies' meteorological reports, which are of special value during the hurricane season, international comparisons were made of the Cuban barometers, through Benito Viñes, S. J., and Capt. L. E. Carbonnelly, of Havana, with a substandard of this Service observed by Sergeant Boyer. From the result of these comparisons it appears that the Cuban barometers are slightly lower than the United States standard, which reads 0.006 inch (0.16 millimeter) higher than that of the Royal College of Belen, under B. Viñes, S. J., and 0.007 inch (0.18 millimeter) higher than that of the Naval Observatory, under the supervision of Captain Carbonnelly.

As a general rule the instruments and supplies of this Service have been purchased, under the contract method, from the lowest bidder. Unsatisfactory results have often occurred from the operation of this system, especially in the construction of new and complicated instruments, and the purchase of special supplies wherein excellence of quality are essential to success. Many of these difficulties have been overcome by purchase of instruments on sample, but in other cases the office, in order to insure successful records, has been obliged to purchase in open market.

The Chief Signal Officer again acknowledges the indebtedness of this office to the Postmaster-General, who has issued such orders as insure not only the prompt transmission of current reports and maps by mail, but also the safe transportation of thermometers, barometers, self-registers, and other fragile instruments which could not be sent by express without incurring a large proportion of breakages or injuries. It is due to the Superintendent of the Railway Postal Service to say that through his instructions, supplemented by the intelligent care of the railway postal clerks, shipments of delicate instruments the past year have been made with great safety, and but few breakages have occurred.

Lack of office force and of space has compelled the Chief Signal Officer to decline to compare thermometers or barometers with the standards of this Service, except in special cases, such as for other Departments of the Government or for scientific observers interested in special investigations. It is believed, however, that it should be a part of the work of this Service to compare, either gratuitously or for a nominal sum, all meteorological instruments which may be presented for such purpose.

The rigid system of thermometric comparisons, initiated by Professor Russell and continued by Professor Marvin, has had not only the ultimate result of insuring the essential correctness of the instruments used by this Service, but has also exercised a beneficial influence upon all manufacturers of the highest grade thermometers in the United States, whose skill in producing a large number of instruments with trifling errors of graduation, rarely exceeding throughout their range half a degree Fahrenheit, may be considered most remarkable, particularly in view of the attendant difficulties.

In securing accurate results from self-registering instruments, not only must the instruments themselves be of the highest standard, but great care and patient attention must be given to the correctness of time intervals, and to other rulings of the various printed forms used in connection with such instruments.

The work of re-arranging samples of all self-registering instruments in the possession of the Bureau, in a special room of the central office so as to give visitors a general idea of the classes of apparatus used for meteorological work, has been pursued as far as means and accommodations would permit. Not only instruments in current use, but those formerly in vogue, have been thus set up in a convenient order so as to afford interested visitors a practical illustration of recognized methods and typical metorological instruments.

THE PUBLICATIONS DIVISION.

The technical preparation and distribution of the weather maps and other publications of this office pertain to the Publications Division, the report whereof appears as Appendix No. 19.

An improvement in the addressing of publications has been made during the year by adopting the plans followed by private corporations throughout the country. The adoption of printed addresses has resulted not only in a saving of time and labor in mailing the several publications, but by the greater accuracy has insured their more speedy and safe delivery. As far as they are applicable, business methods pursued in large newspaper establishments are followed.

THE LIBRARY.

Mr. Oliver L. Fassig has remained in charge of the Library, which now contains nearly 12,000 volumes, exclusive of pamphlets. The policy of exclusively confining purchases to strictly professional publications has been rigidly adhered to. The Library has been much improved in convenience of arrangement and appearance, and for the first time in many years the library books of this office are upon shelves, and so arranged as to be easily accessible and to render proper care possible.

"The General Bibliography of Meteorology," which as completed up to 1882 contained about 50,000 independent titles, has been supplemented largely during the year by Mr. Fassig and his able assistant, Mr. Harold E. Hilton, who, unfortunately for this work, died in July last. In order to insure the safety of this bibliography, which has cost so much time and effort, both on the part of co-operating international meteorologists and of the employés of this Bureau, the Chief Signal Officer has during the past year caused the titles bearing on moisture to be typewritten in lithographic ink, from which a limited number of copies have been made. The Chief Signal Officer in previous reports has not only set forth the great practical value of this bibliography, but has also dwelt upon the propriety of publishing it in full, and he again renews his recommendation that it be printed by authority of Congress at a cost not exceeding $10,000. Cogent reasons for this action have been several times set forth in preceding annual reports.

ACCOUNTS DIVISION.

The disbursements for purchases and for services rendered in connection with the Signal Service have been most faithfully and efficiently made by Captain Robert Craig, A. Q. M., whose report forms Appendix No. 20. The intimate knowledge of the details of this Service possessed by Captain Craig have tended to decrease the heavy burden of care and responsibility which would have inevitably devolved upon the Chief Signal Officer, had the duty fallen to a disbursing officer unfamiliar with the special work of this Bureau.

In Captain Craig's report will be found the list of contracts made during the fiscal year, submitted in accordance with the Act of Congress approved April 21, 1808; also the condition of the appropriations, with expenditures, balances, and probable demands, as required by the Act of Congress approved May 20, 1820.

There have been deposited in the Treasury, as required by law, $614.65 received from the sales of 457 miles of abandoned telegraph line; the sum of $544.88 on account of condemned property sold at public auction, and also the sum of $338.95 received from the sales of publications, under the act approved May 30, 1874, section 227, Revised Statutes, which latter sum accrued to the credit of the appropriation for "Observation and report of storms."

The money accounts of the Disbursing Officer have been thrice inspected, and the balance verified by an officer of the Inspector General's Department, during the fiscal year.

The satisfactory state and prompt settlement of the money affairs of this Service is illustrated by the fact that out of 10,491 accounts, growing out of the various appropriations during the year, there remained on June 30, 1890, only twenty-one accounts unsettled in the office of the Chief Signal Officer, excluding eighteen bills of the Western Union Telegraph Company, which are in dispute as regards the rates fixed by the Postmaster General.

On July 1, 1889, an important reform went into operation, under a provision in the appropriation act approved March 2, 1889, whereby it was directed that the pay and allowances of the enlisted men of the Signal Corps be disbursed in one check by the Disbursing Officer of this Bureau. This legislation corrected the business evil which for so many years prevailed, wherein each man in the Signal Corps received his monthly pay in three different checks, based on three sets of duplicate vouchers, and paid by three different officers and at different times of the month; a method which enormously increased the labor and records, and often delayed the final payment for weeks after the month ended. The new method reduces the labor and records by 80 per cent., and insures to all subordinates prompt and immediate payment, a consideration of especial importance to men of small salaries. The new system has worked to the utmost satisfaction, and, for the first time in the history of the Signal Corps, the monthly compensation of the enlisted men has been mailed to them on the very day when the pay was due. Payments to all the men in the Signal Corps, whether serving in Arizona or New York, are made by check, and as indicating the certainty of the method, it should be mentioned that in the past year 3,571 checks have been mailed to the men of the Corps, and only one check miscarried.

The Chief Signal Officer invites attention to the well-grounded complaint of the Disbursing Officer regarding the rendition of money accounts, in which the accounting officers of the Treasury have, during the year, insisted upon, and in which this Bureau has strictly followed the requirements of the law, *i. e.*, that these money accounts shall be rendered promptly at the end of the month. This Bureau has strictly followed these requirements, but it is proper to invite attention to the fact that notwithstanding the prompt transmission of the accounts of the Disbursing Officer of this Service, they are allowed to accumulate in the Treasury Department for many months without examination. While doubtless this condition of affairs depends upon the limited and insufficient force in the auditing divisions of the Treasury, yet this situation is neither fair to the Disbursing Officer nor just to the Government. Long delays in adjustments tend to increase the difficulties of the Government in obtaining satisfactory vouchers, and likewise augment the difficulties of the Disbursing Officer in rectifying omissions in case of imperfect vouchers.

The forms in use in the Accounts and other Divisions have been carefully examined with a view to simplifying the business methods. As a result, the number of forms have been reduced from 536 to 192, with direct advantage and considerable economy to the Government.

Another important change in the business methods of the Accounts Division is the introduction of the card system of letters received. This has been in operation for the past year, and has not only saved considerable time and labor in the original handling and recording of letters, but under this system letters referred to are much more expeditiously located.

ESTIMATES.

Notwithstanding the establishment, under special appropriation, by Congress of two stations, involving an annual increase of $5,000 in the appropriations, the estimates for the fiscal year of 1892 aggregate for the Signal Corps of the Army and the Weather Bureau the sum of $837,917. These estimates show a decrease of $11,355.50 as compared with the total estimates for the fiscal year of 1891, and a decrease of $258,506.36 since the year in which the present Chief Signal Officer assumed charge of the Bureau. This is also a reduction of $75,105.60 as compared with the total amount appropriated for the year ending June 30, 1888.

In view, however, of the Act of Congress approved this date, it will be necessary to divide these estimates, and incorporate such as pertain to the Signal Corps of the Army with those for other parts of the military establishment, while those for the Weather Bureau will need revision by the Honorable the Secretary of Agriculture.

THE EXAMINER'S DIVISION.

Appendix No. 21 consists of the report of this division, on which devolves the final adjudication of property accountability for all officers of the Army responsible for signal stores, as well for the entire Signal Corps, including under this head all civilian employés; and also with the examination, and transmission to the Auditors of the Treasury Department, of money accounts pertaining to the Signal Service, whether appropriated by Congress or for funds received as tolls for transmission of messages over United States telegraph lines. Also the examination and adjudication of all money accounts pertaining to funds received by Signal Service telegraph operators in trust for the commercial telegraph lines connecting with the lines owned and operated by the United States devolves on this examiner.

The zeal and application of the clerks of this division have been such that, for the first time in the history of the Signal Service, current work is up to date, the preliminary examination of all property returns received to June 30, 1890, having been completed, while all but three money accounts-current had received critical scrutiny.

BRANCH SIGNAL OFFICES.

Lieutenant J. E. Maxfield, Signal Corps, has remained in charge of the Branch Signal Office at San Francisco, California, where he has regularly made daily forecasts of the weather and temperature for the Pacific coast region. His report forms Appendix No. 22.

Lieutenant Maxfield's work has been of a most satisfactory character and his successful forecasts have risen steadily and gradually from a percentage of 78.3 in 1886–'87 to 85.2 for 1889–'90. Special warning of rain for the benefit of raisin growers, which warnings Lieutenan Maxfield has been able to give with great accuracy, were sent out dur ing the raisin-drying season and were the means of saving large quan tities of raisins from damage from the unusually early rains of the year

The following officers of the Signal Corps have also been in charge of meteorological stations, which from their importance and locatior merited the supervision of an official of high standing: 2d Lieu tenant R. B. Watkins, at Cincinnati, Ohio; 2d Lieutenant F. M. M. Beall, at Chicago, Illinois; 2d Lieutenant F. R. Day, at Saint Louis, Missouri; and 2d Lieutenant F. W. Ellis, at Galveston, Texas. The conditions of the Service have improved very materially at Chicago and Saint Louis during the past year, due to the active and intelligent supervision of Lieutenants Beall and Day.

EXHIBIT AT THE PARIS EXPOSITION.

Sergeant Park Morrill, Signal Corps, was detailed in charge of the exhibit at the Paris Exposition of 1889, and his report forms Appendix No. 23. In preparing for this exposition there were no funds at the disposal of the Chief Signal Officer for incidental expenses, and the decision to prepare an exhibit was made at a very late day. Under the circumstances it was possible only to show in a limited manner the methods followed and the work done by the United States Signal Service Bureau. The Chief Signal Officer decided, however, to confine his display to those points in which the United States especially differs from foreign meteorological services. The most essential points are the fulness, number, and variety of publications showing current data, gratuitous issues in the public interests, and unequalled speed of collation and distribution.

The display consisted of samples of the ter- and semi-daily weather maps, of the monthly charts of pressure, temperature, rainfall, prevailing winds, and storm-tracks—which appear monthly in the Weather Review—and such special charts as also are published on appropriate and critical occasions, as charts of first killing frosts, last killing frosts, amount of snowfall on ground at end of month, and others of a similar character; also the original charts setting forth the climatic conditions of the United States for each month of the year, as deduced from 18 year's observations of rainfall and temperature, and such other special climatic charts as have been prepared from time to time for public distribution in the United States.

The instruments exhibited were confined to those of American invention, which from their simplicity and accuracy were thought to be comparable with the work of first-class instrument makers abroad.

It appears from Sergeant Morrill's report that the Daily Weather Map excited special interest, and was considered to be much superior to any similar chart published by other weather services, whether in relation to the amount of data given, the area covered, the size of map, or the technical reproduction of the data thereon.

The exhibits were entered under Class 8, Scientific Expeditions, under which appeared the results and records of the Lady Franklin Bay Expedition; Class 15, Instruments of precision; and Class 16, Maps and Charts.

Sergeant Morrill took especial pains to lay before the international juries data setting forth the extended work of the Signal Service, the size of its organization, the great scope of its duties, its systematized methods of collection, and the facility and liberality of its methods in the diffusion of meteorological information.

It is gratifying to report that no other exhibit of the United States Government received higher recognition, except that of the Department of Agriculture, which was a collective exhibit, involving a large outlay of money and much labor. The Signal Service display received three grand prizes from the Exposition, to which should be fairly added a fourth prize, that for the Lady Franklin Bay Expedition, which was awarded in the name of the Secretary of War, upon whom the general supervision of the expedition devolved, and in whose name it was organized.

The Chief Signal Officer has much pleasure in inviting the attention of the Secretary of War to the energy, skill, and success with which Sergeant Morrill supervised this creditable display and secured its proper recognition. In addition to his labors in connection with the Exposition, Sergeant Morrill was fortunate enough to secure for Professor Cleveland Abbe, of this office, a decoration of the Legion of Honor, the formal acceptance of which Congress has been asked to authorize.

PUBLIC QUARTERS.

In the interest of economy and in order to secure a more efficient service, recommendation was made that the public buildings and grounds at the corner of 24th and M streets, in which the Signal Office is located, so far as their care and preservation were concerned, be placed under the supervision of the superintendent of the State, War, and Navy Department building. This recommendation being approved by the Honorable Secretary of War, Chief Engineer Thom Williamson, U. S. Navy, Superintendent of the State, War, and Navy Department building, was detailed for that duty on October 3, 1889, and the necessary force was transferred to him for heating and guarding the premises. During the year just passed, Congress appropriated the sum of $9,500 for enlarging the heating facilities, increasing the drainage, and for such other repairs as might be required to preserve the main and annex buildings. The disbursement of this sum was placed under the control of Chief Engineer Thom Williamson, U. S. Navy, assisted by Chief Engineer David Smith, under whose direction it has been most judiciously expended. The repairs have not been completed, but are progressing as rapidly as first-class workmanship will permit.

The Chief Signal Officer, for want of technical knowledge, even could time been spared from important duties, could not have secured, for the amount of money appropriated, the quality and quantity of the work which has been so successfully accomplished by Chief Engineers Williamson and Smith, and he deems it proper to express his high appreciation of the very efficient manner in which the work has been done under the direction of these two officers.

SCIENTIFIC RESEARCH.

The advancement of meteorology as a science and the increased accuracy in observations depend, in many instances, upon original investigations of new subjects or along improved lines of research, and this important work has received every attention circumstances permit. At no time in the history of the Service has the intellectual activity relative to the duties of the Bureau been greater than during the past year.

In view of his long service and vast experience in the work of this Bureau, and of his standing as a member of the National Academy of Sciences, Professor Cleveland Abbe has been intrusted with questions of scientific research with a view to the better prediction of storms. The Chief Signal Officer alluded to the "Preparatory Studies for Deductive Methods in Storm and Weather Predictions," prepared by Professor Abbe, in his last annual report, and expressed the hope that these investigations might be of great practical as well as theoretical value. The absence of Professor Abbe, at the request of the Honorable Secretary of the Navy, as meteorologist to the United States Scientific Expedition to the West Coast of Africa, has prevented further work of this character, and at the end of the fiscal year Professor Abbe had not returned to duty in this office, nor had he been able to practically test the accuracy of his "Deductive Methods."

Captain Allen has submitted a paper, Appendix No. 24, the result of long and careful investigation, which it is hoped will have an important effect in improving forecasts as to rain, bearing, as the memoir does, on the relation of the dew-point to the subsequent movement of the storm-centre and the extent of the accompanying rain area.

Captain Dunwoody's investigations are incorporated in the Monthly Weather Review, which has been prepared under his supervision for nine months in the year.

Lieutenant Finley has prepared special studies in relation to tornadoes, and also storm-tracks, fog, and ice tracks of the north Atlantic Ocean, and hurricane-track charts of the Gulf of Mexico. These important contributions have been published, with the permission of the Chief Signal Officer, as private ventures.

The active part taken by atmospheric moisture in the formation and development of storms makes its accurate measurement of great importance. In 1885 the dew-point and relative humidity tables of the Service were revised upon the basis of a large number of careful experiments, confined, however, almost wholly to temperatures above the freezing point. The very low temperatures occurring each winter at many stations of this Service render an extension of these tables in this direction very necessary. The work, in addition to a comparison of the psychrometer and dew-point apparatus, involved also an independent determination of the maximum pressure of aqueous vapor at these low temperatures. These investigations necessitated the verification and extension of the elaborate and remarkable work done in this direction by Regnault nearly fifty years since, and it consequently required a thorough knowledge of physics, skill in laboratory experiments, and unusual deftness of manipulation. The Chief Signal Officer entrusted this important work to Professor C. F. Marvin, who was somewhat embarrassed in his delicate experiments by want of suitable conveniences and instruments, and the inability to have the necessary special apparatus made by skilled instrument makers. Professor Marvin was obliged not only to make delicate apparatus himself, but to go over and improve upon the methods of his predecessors, and to devise means and methods for overcoming difficulties previously viewed as insuperable.

Professor H. A. Hazen was detailed temporarily as assistant to Professor Marvin in these investigations and in connection with them proceeded to northwestern Minnesota in order that the observations might be made in the extreme natural cold of winter in that region, while Professor Marvin continued his laboratory experiments in the central office. While in Minnesota Professor Hazen supplemented his work of vapor pressures by making valuable sets of comparisons between values of the dew-point obtained by psychrometrical observations with those obtained by direct observations of the Regnault dew-point apparatus. The results obtained were most satisfactory, and during the present year Professor Marvin will verify and complete this important work. The outcome so far shows slight but systematic variations from the values given by Regnault. An account of these original investigations will be found in the report of the Instrument Division, Appendix No. 18.

The Chief Signal Officer deems it proper to acknowledge the courteous co-operation of Professor W. W. Payne, of Carleton College, Minnesota, who kindly placed his laboratory at the disposal of Professor Hazen during his experimental work.

An investigation, perhaps more important from its practical bearings, was also undertaken by Professor Marvin involving the accurate determination of the velocity of the wind and more particularly its actual pressure during its more violent gusts.

The studies previously made of the accurate measurement of wind movements were continued by extended comparisons of different anemometers, the results of which have been reduced to a new and more accurate formula than that heretofore used. The difficulty and expense of making direct experiments at high velocities has limited the work in this direction, but it is anticipated the investigation will be extended in the future. The great practical importance to engineers and others of the amount of wind pressure corresponding to different velocities, and the grave discrepancies in the results from different sources, led to a short series of experiments upon wind pressures made in the high winds common to the station at the summit of Mount Washington. The value of this investigation was the greater because of the direct manner in which the problem was attacked, giving at once the relation of pressures to observed velocities without regard to the imperfect knowledge of the true anemometer formula. These investigations are of such importance in connection with the current work of this Service that they are incorporated in this report as Appendix No. 25.

Lieutenant Glassford prepared a report on the climatic conditions of the arid regions, which was submitted to the Committee on Irrigation of the United States Senate, and also has devoted a portion of his time to the preparation of a special paper on climatic conditions in Arizona, which will form part of the data to be transmitted to Congress under the resolution of the House of Representatives of May 23, 1890.

Impressed with the number and violence of destructive tornadoes during the past year, the Chief Signal Officer believed it a timely duty of this office, while investigating recent phenomena of this kind, to also determine, as carefully as could be done from existing data, the average number of tornadoes in the United States, the area devasted by them, the number of lives lost annually, and such other information as might be of current public interest. This work was intrusted to Professor H. A. Hazen, who had given much time and attention to these phenomena and had published, privately, several studies and memoirs upon the subject. A special paper on tornadoes, bearing directly on the current work of the Service, is submitted herewith as Appendix No. 26.

In investigating tornadoes, great difficulty was experienced in accurately determining property losses or loss of life, the difficulty resulting from exaggerated reports which are invariably spread over the country in connection with public calamities of this kind. For instance, the Louisville tornado of March 27, 1890, was months later reported by the public press to have caused a loss of 500 lives instead of 135—the true number. Professor Hazen divided the tornadoes into three classes: first, violent storms causing destruction; third, the most severe tornadoes, and placed in the second class all other known violent storms. While there were about one thousand tornadoes, each, in classes 1 and 2, causing the death of 1,071 people, an average of one person to two storms, and a loss of about $23,000,000 in property, yet there were but 58 tornadoes of a very violent character, killing 755 people and destroying property to the amount of $11,894,700, an average loss of 13 lives and over $200,000 of property to each storm of class 3.

Several methods of determining the average destructive area covered by tornadoes were tested. In one case the result gives the relation between the total area visited annually by violent storms of all classes to the area of the state, with the following result: In Alabama, one square mile of *limited* destruction annually to each 7,866 square miles; Arkansas, one to 14,418; Georgia, one to 6,696; Illinois, one to 8,172; Indiana, one to 6,210; Iowa, one to 7,164; Kansas, one to 9,720; Michigan, one to 18,396; Missouri, one to 6,336; Ohio, one to 4,554; Pennsylvania, one to 9,972; Wisconsin, one to 12,042. These figures, of course, are not strictly comparable, especially when we consider the state of Ohio, which has a very large number of intelligent voluntary observers, on the one hand, and Kansas, on the other, a state not thickly settled in all sections.

Another plan followed was to consider the area of destruction covered in all well-studied and *destructive* tornadoes, and then apply that area by weight to all violent storms of each state. The following table shows the relative numbers: Alabama, one square mile of devastation or *severe destruction* to each 480,600 square miles; Arkansas, one to 712,800; Georgia, one to 504,000; Illinois, one to 185,400; Indiana, one to 330,000; Iowa, one to 432,000; Kansas, one to 436,500; Michigan, one to 914,400; Missouri, one to 406,800; Ohio, one to 243,000; Pennsylvania, one to 468,000; Wisconsin, one to 475,900. These results are materially different from those first given and they appear more satisfactory. Such methods of comparing destroyed with undestroyed areas are, of course, incomplete and must be received with caution.

It appears from these data that in no state may a *destructive* tornado be expected oftener, on an average, than once in two years, and that the area over which the total destruction can be expected is exceedingly small even in the states most liable to these violent storms. Professor Hazen's figures regarding the relation of destruction by fire to that of tornadoes are interesting, and worthy of consideration.

The Chief Signal Officer believes this matter of great public importance, and desires to impress upon the people at large how small are the chances of personal injury or loss of property in this connection.

It is well settled, however, that in the last eighteen years the annual death casualties from tornadoes average 102 annually. While this is a large number, yet it does not appear to be as great as the death casualty from lightning, since during the present year from March to August, inclusive, there were 102 lives lost by lightning, and in compiling this record the list is incomplete, especially as regards the Southern States. It may be safely assumed that, dangerous as are tornadoes, they are not so destructive to life as thunder-storms.

GENERAL REMARKS.

The Chief Signal Officer invites attention to the necessity of a reorganization of the clerical force in the central office. Despite the fact that this Bureau is a technical one, necessitating on the part of its clerks special knowledge and training, yet the average pay of clerks in this Bureau is $153 below that of the average in the various bureaus of this Department and $87 below that of the bureau receiving the next higher order of pay. Two years since the efficiency of the clerks of the central office equalled that of any other bureau in Washington, but the depletion of this office of its excellent men, by direct transfer or resignation to accept appointments in other bureaus of the Government, has gone steadily on, and their places have necessarily been filled by men far below the average standing of the Bureau. Within two years this office has lost, by transfer or by resignation to accept more lucrative appointments, 28 clerks. It naturally follows that the efficiency of the Bureau has been materially impaired. The reorganization can be affected without expense to the Government by cutting off the six copyists now receiving salaries of $600 or $720 annually and adding this amount to the compensation of other clerks as an inducement to them to remain in their present positions. More work will be done by ten skilled than by even twelve unskilled clerks.

The Chief Signal Officer has before invited attention to the fact that with one exception the professors of this Service receive only $1,800 annually, the compensation of a fourth-class clerk. The duties of forecasting and of scientific investigation in connection with the improvement of this Service devolve more and more upon these professors, as officers of the Army who have been employed in this work are being displaced in carrying out the announced policy of Congress for a civil administration of the Bureau. First-class work can only be expected from men receiving proper compensation. In the opinion of the Chief Signal Officer the assistant professors of this office should receive not less than $2,400 annually, and the full professors $3,000, with an increase of $200 for every five years of employment. These salaries are substantially the same as those received by the officers of the Army who have in the past performed this work. It must not be understood that the Chief Signal Officer believes these to be the highest salaries that should be paid, for it is evident that if the professors in time become very expert they should be paid in proportion to the value of their services to the country, and receive the compensation now paid to the senior professor of this Service, $4,000.

I am, very respectfully, your obedient servant,

A. W. GREELY,
Chief Signal Officer.

LIST OF APPENDICES ACCOMPANYING THE REPORT OF THE CHIEF SIGNAL OFFICER OF THE ARMY FOR THE YEAR ENDING JUNE 30, 1890.

APPENDICES COVERING REPORTS ON THE FOLLOWING-NAMED SUBJECTS.

1.—Military signaling.
2.—Telegraph lines.
3.—Correspondence.
4.—Verifications.
5.—Cold waves.
6.—Rivers and floods.
7.—Meteorological stations.
8.—State weather services.
9.—Meteorological records and data.
10.—Meteorological stations, Signal Service, in operation 1870-'90.
11.—Annual summaries, meteorological data, of regular stations.
12.—Temperature data of regular and voluntary stations, including monthly and annual means, maximum and minimum temperatures.
13.—Annual precipitation and excessive rainfalls, regular and voluntary stations.
14.—Average hourly wind movement at 65 selected regular stations, deduced from seven years observations.
15.—Voluntary observers co-operating during 1889.
16.—Dates of first and last killing frosts.
17.—Dates of opening and closing of navigation.
18.—Instruments.
19.—Publications.
20.—Accounts.
21.—Auditing accounts (examiner).
22.—Branch meteorological office for Pacific Coast.
23.—Exhibit at Paris Exposition 1889.
24.—Relation of dew-point to rain forecasts (by Capt. James Allen, Signal Officer).
25.—Wind pressures (by Assistant Prof. C. F. Marvin).
26.—Relative frequency of, and probable danger from, tornadoes (by Assistant Prof. H. A. Hazen).

APPENDIX 1.

REPORT OF THE OFFICER IN CHARGE OF THE DIVISION OF MILITARY SIGNALING.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington, D. C., July 31, 1890.

SIR: I have the honor to submit the following report of affairs pertaining to the military signaling division of the office for the year ending June 30, 1890.

The very radical change made last year in the signal code from the English to the American Morse, instead of creating dissatisfaction among those skilled in the use of the old code, has met with hearty approval on all sides. The new code has been found as easy to memorize and retain as the old, and nearly as simple in its practical application, and the fact that, as it is the telegraph code of the country and a signalman can be made of a telegrapher wherever found, has seemed to outweigh the natural objection to relinquishing the old and taking up the new.

In consideration of the general utility of a telegraph line, and because of the satisfactory manner in which a knowledge of the code could be obtained by practice over it, the Secretary of War decided to permit the equipment of all posts throughout the Army garrisoned by four or more companies with short practice telegraph lines and the necessary instruments. In consequence, one hundred and seventy-eight sets of telegraph instruments, 23 miles of wire, and other material, such as connectors, insulators, brackets, batteries, etc., have been supplied, and at several of the posts, at which telegraph operators of the service are stationed, these operators have, on recommendation of department commanders, been directed to assist the acting signal officers in giving instruction.

TELEPHONES.

As mentioned in the previous report, the service is possessed of one hundred and nine telephones which are distinctly the property of the United States, but in the transaction of the business on military telegraph lines and the equipment of rifle ranges, it has been found that many more instruments are needed. These can only be procured by rental from the telephone company having the patent for this instrument. The agreement between the Government and this company as to rental is that, at an expense of $5, the use of a single telephone may be had for one year. There is also an agreement that, at an expense of $25, a single instrument may be rented for its life, which practically amounts to a purchase. In procuring the extra supply needed for the equipment of posts, the amount of money available did not admit of the purchase outright (life rental) of a sufficient number to fill requirements and therefore the money was apportioned between annual rental and life rental. Under this division forty-two instruments have been rented for life, and a sufficient number obtained by annual rental that the rifle-ranges of the larger posts throughout the Army and including the department ranges could be equipped and requisitions from artillery posts designated by the commanding general filled in a great measure.

The *field telephone* has been perfected during the year and will make for the Army a most excellent equipment. The complete instrument comprises two telephones, two transmitters, one-half mile of double conductor wire with knapsack, reel, and pouch for carriage of the dry batteries and key. The equipment is readily portable and if a complete set were furnished to each company in the service it would doubtless be applied to most useful purposes, but unfortunately the equipment is exceedingly expensive, costing in the neighborhood of $400, the telephones themselves absorbing but a quarter of this sum, the greater part of the balance being taken up by the cost of the light, pliable, strong, double conductor, by means of which alone it is possible to establish communication without the delays for special insulation or making ground. However, notwithstanding its great cost, it will undoubtedly be necessary to supply this equipment without regard thereto in time of active service, and although the Signal Corps now has one complete equipment which would serve as a model for others, yet as considerable time would elapse before the construction of similar ones could be completed, and also because of the experience that will be gained by practice with it, it is believed that a small stock of these equipments should be procured.

HELIOGRAPHS.

The Army is now pretty well equipped with service heliographs, all except the smaller and less important posts having at least two, and many of them old-pattern instruments in addition. Ten of the new station heliographs have also been procured and furnished to the Department of Arizona. Except in respect to minor details, which are constantly undergoing improvement, the instrument is practically perfected, and the character of results which may be obtained by means of it is well shown in the concerted practice of the Department of Arizona. The superiority of the service instruments to those of other make arises in part from the simplicity of our design and the care exercised in construction, but is due more especially to the excellent quality of the mirrors. Considerable difficulty has been experienced in procuring those that would meet the rigid test of the office, but the result compared with that obtained from an indifferent mirror is sufficient to warrant the increased labor and expense, our small field mirror giving a brighter flash than that of the Mance with a much greater reflecting surface, a result due solely to difference in quality.

A special screen devised by Captain Allen has been sent out to a few of the posts most energetically engaged in heliographing, the necessity for a stronger device having made itself apparent. The principle upon which this screen is constructed is rather more satisfactory than that of the old, and it is hoped by means of it that the difficulties inherent in the old system may be avoided, but it seems not improbable that its rapid and direct action will require some modification. The old screen is practically a rectangular fan which plays to and fro upon one of its sides as an axis. It is evident that the resistance of a strong wind will at times become troublesome, and experience has shown that the leverage of the fan, although apparently inconsiderable, yet when brought constantly into play during the transmission of a message, is sufficient to eventually weaken the connection between the vulcanized fiber and its frame, the small screws being insufficient to withstand the shock. In the Allen screen the bad effect of the leverage and multiplied shocks is overcome, the screen being designed to cut rather than fan. Experiments with a double-leaf screen have also been made, and a few of this pattern have been sent out. The extensive heliograph practice in Arizona has also produced the natural result of stimulating the inventive genius of those engaged in it, the device of Captain Murray notably, which is somewhat similar to our double-leaf screen, promising a satisfactory solution of the trouble.

CONCERTED HELIOGRAPH PRACTICE IN THE DEPARTMENT OF ARIZONA.

The campaign of General Miles in 1886 brought the work of heliograph signaling so prominently to the front as an adjunct in Indian warfare that shortly after its close, in 1887, Lieut. W. A. Glassford, Signal Corps, then stationed at Prescott, Ariz., unwilling that the interest in this direction should be suffered to die out simply because immediate occasion for practical use for the heliograph had ceased, and seeing how desirable it was that the Signal Office should be provided with information that would enable it to quickly establish a complete system embracing not only the points covered in the Geronimo campaign, but others which might be available as heliograph stations supplemental thereto, this officer traveled extensively throughout the region mentioned, taking notes that would guide in future operations. These he subsequently submitted to this office accompanied by a map depicting the relative positions of the best points available as permanent stations. A copy of the report and map were subsequently furnished the commanding officer, Department of Arizona.

After the relief of Lieutenant Glassford from duty in the Southwest little interest was taken in the matter till 1889, when Maj. W. J. Volkmar, assistant adjutant-general, an officer who, in his earlier service, had taken much interest in the subject of signaling and who had not yet lost his vivid interest in practical matters, was assigned to duty as chief signal officer of the Department of Arizona and conceived the idea of putting to the test the practicability of covering the vital parts of his department with a system of stations manned by competent officers and men.

Having the full support of his immediate commander, which enabled him to bring to his aid the resources of the department and of the Chief Signal Officer, who placed at his disposal the necessary equipments and instruments, he was in position to make plans on a large scale and carry them into practical execution, comprehending an extension of the system previously operated. This was effected through the energetic and intelligent co-operation of the officers and men in the Department of Arizona. Measures were taken, through instructions published from headquarters, to cause extensive reconnaissances to be made for stations which would not only connect the various divisions and form a general chain through Arizona and New Mexico, but would embrace outlying garrisons and important points not on the main line.

Most thorough reconnaissances were made; the rugged country was scoured by officers and men from the various posts in the department, oftentimes under conditions of great discomfort. Unnecessary intermediate stations were eliminated and important new ones added, the system of co-operation among officers in the field being such that they not only located stations by magnetic bearings and by reference to well known points, but sought out each other and often verified positions by flash.

The preliminary work was so thorough that the concerted practice following far exceeded in results anything heretofore accomplished in this country, or any other so far as known. Two thousand miles of lines were operated, and the distance of 75 miles, which had previously ruled as the greatest range, was exceeded by ranges of 85, 88, 95, and 125 miles, and a perfect network of communication was maintained for two weeks over a country inconceivably rugged and broken, the stronghold of the Indians of that section. The stations were manned by 33 officers and non-commissioned officers, and 129 operators, and 3,785 messages were exchanged, comprising 92,406 words. In fact complete and satisfactory demonstration was made of the possibilities of the instrument, and the heliograph system of this important section definitely marked out and approved, so that its reoccupation in time of necessity is now mainly a question of transportation.

The following is a list of the officers participating:

Maj. W. J. Volkmar, assistant adjutant-general, chief signal officer, Department of Arizona, in charge.

Lieut. J. A. Perry, Tenth Infantry, aid-de-camp, assistant.

Capt. C. H. Murray, Fourth Cavalry, superintendent, Arizona system.

Lieut. H. W. Hovey, Twenty-fourth Infantry, superintendent, New Mexico system.

Officers in charge.	Stations.
Lieut. L. D. Tyson, Ninth Infantry	Whipple Barracks.
Lieut. C. W. Fenton, Ninth Infantry	Bald Mountain.
Lieut. F. DeW. Ramsey, Ninth Infantry	Fort Verde.
Sergt. A. J. Robinson, Ninth Infantry	Squaw Peak.
Lieut. G. B. Duncan, Ninth Infantry	Baker's Butte.
Lieut. C. Overton, Fourth Cavalry	Mazatzal Peak.
Lieut. E. Wittenmyer, Ninth Infantry	Mount Reno.
Lieut. W. A. Campbell, Ninth Infantry	Fort McDowell.
Lieut. C. Reichmann, Twenty-fourth Infantry	Lookout Peak.
Lieut. G. E. Stockle, Tenth Calvalry	
Lieut. R. D. Read, jr., Tenth Cavalry	Pinal Mountains.
Lieut. H. C. Keene, jr., Twenty-fourth Infantry	
Lieut. W. T. Littebrant, Tenth Cavalry	Table Mountain.
Lieut. A. L. Dade, Tenth Cavalry	Mount Graham.
Lieut. M. R. Peterson, Tenth Infantry	
Lieut. J. M. Neall, Fourth Cavalry	Bowie Peak.
Sergt. E. M. Griffin, Fourth Cavalry	Stein's Peak.
Lieut. F. H. Albright, Ninth Infantry	Fourr's.
Lieut. W. H. Hart, Fourth Cavalry	Fort Huachuca.
Sergt. P. Bartsch, Fourth Cavalry	Colorado Peak.
Corpl. L. P. Gouldman, Fourth Cavalry	
Lieut. G. H. G. Gale, Fourth Cavalry	Fort Lowell.
Lieut. C. D. Rhodes, Sixth Cavalry	Camp Henely.
Lieut. William Black, Twenty-fourth Infantry	Fort Bayard.
Lieut. J. D. Leitch, Twenty-fourth Infantry	Fort Cummings.
Sergt. D. J. Dolsen, Sixth Cavalry	Rincon.
Lieut. R. B. Paddock, Sixth Cavalry	San Andreas.
Lieut. A. W. Brewster, Tenth Infantry	Sierra Blanca.
Lieut. J. J. Pershing, Sixth Cavalry	Fort Stanton.

Many interesting reports relating to the practice have been received and will soon be published in pamphlet form with map showing the location of stations, etc. These, besides setting forth in an entertaining manner the operations of the line, give much information which is of special value to this office as bearing directly upon the construction and improvement of instruments and articles of the equipment.

MISCELLANEOUS.

During the year 257 requisitions for signal equipments and stores have been received. In filling these reference has been had to the consolidated Department reports of needs at the various posts, the surplus at some of them, and the material rendered available by the abandonment of others. With management, most of the important requisitions have been filled, but the more liberal appropriations for the present year will enable the division to consider its estimates with much greater regard for the interest of the service than was possible under the paring and clipping methods heretofore necessary.

In the rendition of returns by acting signal officers, many inappropriate forms, the legacy of war times and more cumbersome methods, were found to be in use. It was very obvious that an improvement in this direction could easily be made, and the assignment of a board of officers, by the War Department, to the task of revising the forms of all the bureaus, gave the opportunity for dispensing with some and remodeling, consolidating, and substituting others, and in consequence, instead of the necessity for selecting from the hundreds of forms used by this Bureau fifteen or twenty of such as seem to have a bearing in a military way, although in some instances originally designed perhaps for other uses, it was found possible to comprise in seven forms everything adequate for the care of property, reporting of instruction, etc. One of these forms, the new message blank, is worthy of mention. It is so designed that compliance with the requirements indicated upon it will, in a great measure, if not entirely, avoid the complications experienced during the late war from lack of precision in recording times, places, and circumstances connected with the sending and receipt of important dispatches.

The forms now in use and the allowance of stationery are designated in the following instructions.

[Instructions No. 1.]

SIGNAL OFFICE, WAR DEPARTMENT,
Washington, January 2, 1890.

I.—The reports and returns required from acting signal officers under the regulations are rendered on blank forms furnished by this office.

Such forms will be supplied on proper requisitions as they may be required, and the annual allowance, under ordinary circumstances, will be:

Eight forms No. 1 A, Return of Signal Property.
Eight forms No. 2 A, Invoice of Signal Equipments and Stores Transferred.
Eight Forms No. 3 A, Receipt for Signal Equipments and Stores Transferred.
Eight forms No. 4 A, Certificate of Signal Stores Expended.
Four forms No. 5 A, Special Requisition for Signal Equipments and Stores.
Twelve forms No. 7 A, Report of Instruction and Practice in Military Signaling.
(Forms No. 6 A, Message Blanks, are supplied with the stationery.)

II.—Stationery, varying in quantity with the strength of the command, as set forth in the accompanying table, will be supplied without requisition to acting signal officers at military posts on the 1st day of January and the 1st day of July of each year.

Strength of garrison.	Envelopes, large, franked.	Envelopes, small, message.	Erasers, rubber.	Pads, message.	Pads, scratch.	Paper, blotting sheets.	Paper, letter, quires.	Paper, telegraph, packages.	Pens.	Pencils.	Pen-holders.
Companies:											
1 and 2	6	50	1	6	5	1	1	2	12	10	1
3	6	50	1	9	7	1	1	2	12	13	1
4	8	75	1	12	10	1	1½	3	12	15	1
5 and 6	8	75	1	14	12	2	1½	3	12	20	1
7 and 8	10	100	1	16	15	2	2	4	15	23	1
Over 8	12	100	1	18	18	2	2	4	15	25	1

The new blanks designed for the complete and accurate record of dispatches are bound in packages of 50 in such manner as to be readily detachable. The following is a copy of this blank:

[Front.]

(FORM No. 6 A.) [MESSAGE BLANK.

WAR DEPARTMENT, SIGNAL CORPS, U. S. A.

Station,..

Date, ..., 189 .

No. sent,	Check,	No. rec'd,

Time sent,	Time rec'd,
Sent by	Rec'd by

Underscore mode of communication: Telegraph, Telephone, Flag, Torch, Heliograph, Lantern, Courier.

(Place,)..

(Date,)..., 189 .

To..

....

....

....

....

....

....

....

....

....

[Back.]

INSTRUCTIONS.

1. This blank will be used for field messages, both sent and received. In time of active operations exact duplicates of all important dispatches will be taken by means of carbon paper.

2. The sending operator will enter *name of his station, date, number sent, time of receipt of message, time sent, by whom sent, and check* (number of words or groups of cipher in body of message).

3. To transmit a message the operator will send—1st, *number of message* and "call letter" of sending station; 2d, *operator's personal signal;* 3d, *the check;* 4th, *place from and date;* 5th, *address in full;* 6th, *period* (address complete); 7th, *body of message;* 8th, *Sig.* (signature follows); 9th, *signature.*

4. The receiving operator will add to the message received the *month, date,* and *year,* and *omit* the abbreviation "*Sig.*," and, after satisfying himself that the check and number of words in body of message correspond, will give "OK," followed by his initials or personal signal. He will then enter name of his *station, date, number received, time received,* and *by whom received.*

5. Official and military messages have precedence on the Government telegraph lines. Communications transmitted by telegraph or signals are always confidential, and will only be revealed to those officially entitled to receive them. A. R. 1760.

The following is the new form of instruction and practice in military signaling adopted by the Army board:

WAR DEPARTMENT, SIGNAL CORPS, U. S. A.

Report of Instruction and Practice in Military Signal.ng at ———, in the Department of ———, during the month of ———, 18——.

Officers and enlisted men under instruction.		Number of hours of preliminary instruction. *a*	Number of hours of field practice. *b*				Proficient. (Yes or no.)	Remarks. (In this column will be noted reasons for changes in the detail, practical use made of, and, in general, all matters of interest relative to signaling.)
			Day practice.		Night practice.			
Rank and name.	Company and regiment.		Flag.	Heliograph.	Torch.	Lantern.		

(Sign here.) ——— ———,

——— ———, *A. S. O.*

(Indorsed;) (Form No. 7 A.) Report of instruction and practice in military signaling at ——— in the Department of ——— during the month of ———, 18—. To be rendered to the Chief Signal Officer, through department commanders, at the close of each practice month, as required by A. R. 1761.)

a Preliminary instruction will be given in the alphabet and conventional signals, method of opening communication, transmitting and recording messages, duties of signal-men at terminal and intermediate stations, use of cipher disk, composition, method of adjustment, and use of the field-glass, telescope, and heliograph, and practice with wand at high rate.

b Practice with flag, torch, heliograph, and flash-lantern should begin at short range between terminal stations in both sending and receiving; terminal stations should then be located so as to require the use of one or more intermediate stations, and thereafter the distance should, as proficiency is acquired, be increased until such range is attained as to necessitate the most careful uses of the telescope.

During the year a practical demonstration of a new means proposed for communicating between ships was witnessed. The device consists of a species of magic lantern by which letters of enormous size are thrown upon the sails, words being spelled out with considerable rapidity. The brightness of the letters depends on the illuminating power of the light used, their size being in proportion to the distance of the instrument from the screen. A test of its utility for short distances was made between the Washington Monument and Fort Myer, the letters being plainly visible over this range. The apparatus worked well, but is somewhat unhandy, and the necessity for the use of a calcium or other strong light involving the manipulation of gas, is decidedly against its being adopted for general use.

A pair of French signal lanterns (the Mangin), a small foreign signal lantern for the use of first sergeants of companies, and a flash lantern of English make are now in possession of the office. They have been overhauled and tested, but each was found objectionable in one or another respect, and to avoid the defective features, this service has had two flash lanterns designed to not only replace the torch as a portable night equipment, but to effect a considerable increase of range and saving of manual labor. These instruments were sent to the troops in the West for test, and while not wholly satisfactory in mechanical details, it is believed they contain the germs of what will eventually become the night signal equipment.

Eight models, similar to which it is probable, future supplies of field glasses will be obtained, have been selected by a board of officers from 137 samples submitted by dealers at home and abroad. These models necessarily vary in respect to relative properties of power, field, light, and definition, but in their respective classes are good representative instruments. Two of them are very superior. Recent reduction in the cost of aluminium make it possible that a portion of the better glasses to be supplied to the Army can be obtained in this metal, and the objectionable feature of weight will be nearly eliminated.

The commanding general has authorized the detail of a signal officer to Fort Riley for the purpose of giving instruction relative to the maintenance of communication by signals and the use of instruments and devices by means of which it is accomplished. It is a matter of congratulation that the facilities of a post and the services of a special officer are made available, as not only will greater uniformity in instruction and practice result, but it will be possible to more effectively make practical test of the different parts of the equipment now in the experimental stage, and to take better care of the larger and more valuable articles of the field train, the necessity for some action to this end being only too apparent, the shed at Washington Barracks containing the lance trucks, battery and wire wagons, and the portable tower affording only partial protection from sun and rain, and being liable to inundation from the Potomac, the water at one time rising so high that lances floated from the truck.

Valuable reports have been received during the year relative to signaling and kindred subjects abroad. The number of books, pamphlets, reports, etc., bearing on these questions has grown to such proportions that to render their instant utilization practicable the preparation of an index of subjects has been undertaken.

Instruction and practice in signaling was carried on at military posts under provision of paragraph 1761, Army Regulations. From reports received the maximum number of officers under instruction during any one month was 73 against 51 during the preceding year, while that of enlisted men was 1,087 against 715, and these ratios were maintained for over five months.

This stimulus in instruction is due to the fact that to have acquired the new code is to become possessed of an accomplishment valuable as well outside as in the Army, to the erection of telegraph practice lines, to the fact that the charge of matters has been placed within the hands of department commanders, and the Inspector General has embraced the subject among those to be inquired into by his department.

The character of requisitions received, the reports of instruction and the request for information show that interest in signaling has in no wise abated, if it has not actually received more attention than formerly.

At Fort Monroe signal operations were conducted in connection with artillery practice, the acting signal officer, Washington Barracks, reporting in connection with Batteries K and L, Third Artillery, that the service rendered by the non-commissioned officers and instructed privates in signaling and receiving messages by flag was so efficient and exact that it was found unnecessary to make use of the instructed telegraphers in the batteries. Angles were received at the observation house faster than they could be plotted, under all conditions of weather, and with scarcely an error during the entire practice.

At Fort Adams a great deal of similar work was done during the target season.

At Fort McHenry, during the bombardment in September, communication was maintained daily by signaling between the fort and the war-ships in the harbor, the messages being received and sent rapidly and accurately.

At Fort Wadsworth communication by heliograph was opened with Governor's Island in January.

At Plattsburgh Barracks practice with telegraph instruments in the company amusement rooms is voluntary and attended with good results.

At Fort McPherson signaling by heliograph was had between the post and Kenesaw Mountain, a distance of nearly 21 miles.

Several of the commands in the Department of Dakota (Forts Keogh, Assinniboine, Maginnis, Snelling) practiced while in summer camp, on the march, and during the maneuvres of the troops.

At Fort Yates the signal detachment was excused from regular company drill on days of signal drill, and as a consequence took great interest in the latter. The men were allowed to take flags and heliographs to their quarters each day after the regular exercises, and by the additional practice thereby obtained, they have acquired a much greater skill in signaling than they could have attained in the same time by the regular drills only.

At Fort D. A. Russell the interest in telegraphy is so great that several of the men have purchased instruments, etc., at their own expense.

At Camp Schofield the signal detail did signal work during the maneuvers.

At Fort Gibson great interest is shown in telegraphy, and at Fort Ringgold practice in this branch is had by members of the signal class who volunteer.

The troops in the Department of the Columbia had signal practice during the fall maneuvers at Camp Umatilla, and rendered valuable assistance in the field operations, giving important information by signals of the enemy's position in the sham battles.

At Fort Stanton heliograph practice was had in July at distance of 20 miles.

At Fort Apache the signal class was employed during September in the field, operating with troops on practice marches in the White Mountains. Communications were established with all commands and detachments out; longest line worked, 40 to 45 miles.

At Fort McDowell heliograph stations were established during September in the Sierra Quebo and Mazatzal Mountains of the Tonto Basin. Mount Reno and Baker's Butte were selected for communication between Fort Verde and San Carlos. April 1 to 14 was devoted to constant field work, including heliograph signaling and reconnaissance. Greatest distance signaled about 40 miles, from North Peak to the post.

At Whipple Barracks part of the signal detail was employed during September for maintaining communication by heliograph, flag, and torch between the post and two practice camps. From April 5 to 9 a detachment was employed in concerted practice with the adjacent post, Fort Verde. The longest range was between Bald Mountain and Baker's Butte, a distance of 60 miles air line.

At Fort Marcy practice was had with a heliograph (2-inch mirror) at distances from 4 to 21 miles. The post has also a telegraph practice line constructed and maintained at private expense.

The signal detail at Fort Bayard had practice during November on all stations between the post and Huachuca. During December communication was sucessfully established with Fort Stanton.

At Fort Mojave practice in military signaling is part of the daily routine. On the night of May 29 communication was successfully established by torch with a detachment of Company A, Ninth Infantry, in Black Range, a distance of 22 miles (the greatest range attained with the torch of which there is any official record).

The signal class at San Carlos was engaged during November in field work and employed in reconnaissances with a view to locating heliograph stations. Communication was established with the post from the Triplets, Mount Turnbull, and Point Glassford. During December messages were exchanged over a range of 109 miles with several intermediate stations.

At Fort Grant the interest taken in signaling is shown by the fact that men voluntarily go out and practice Sundays.

At Fort Huachuca messages were exchanged during March with a signal party from Fort Lowell, stationed on Colorado Peak, distance 50 miles.

At Fort Verde a through heliograph line was established during March with Whipple Barracks. From April 5 to 9 stations on Baker's Butte and Squaw Peak were occupied, and communication established with Lookout Peak, Mount Reno, and Bald Mountain.

MILITIA.

Letters have been received during the year from officers or those interested in signal matters within the National Guard of the States of California, Indiana, Massachusetts, Michigan, New Jersey, New York, Ohio, Oregon, and Pennsylvania. A number of these States and some designated in previous reports have carried their organization and practice to considerable perfection, and have not only made experimental demonstration of their ability to hold distant communication, but in some instances have made use of their signal corps in execution of maneuvers during their annual encampment. The National Guard of New York appears to have made a success in this direction, the assignment of a regular officer to duty in connection with the troops of this State having doubtless stimulated activity.

The details which have also been made of a regular officer to similar duty with the Ohio troops and of another with the militia of Pennsylvania will doubtless bear similar fruit.

In consequence of the application of the governor of the latter State, Lieut. S. Reber, Fourth Cavalry, has been assigned by the Secretary of War to the encampment of its National Guard at Mount Gretna, whose special duty is to establish communication between the several headquarters in the camp and to illustrate the workings of the various devices of this service and its advanced methods in communicating by night and day. Flags, torches, lanterns, and heliographs have been supplied to illustrate the principle of visual signaling, and line material and instruments and the field-telephone kit to demonstrate the methods of establishing and maintaining electric communication.

Indiana has also taken steps looking to the organization of a signal corps and its utilization during the annual encampment, the following order having been issued in March:

* * * * * * *

"2. The commanding officers of the First, Second, and Third Regiments of Infantry, Indiana Legion, will each detail a lieutenant as assistant signal officer.

"3. The commanding officers of companies will each detail one non-commissioned officer and six privates for instruction in signaling; such company details must be filled from those most proficient in drill and knowledge of military duties, to be selected by a public examination or drill: *Provided, however*, That wherever practicable at least one man in each company detail shall be a practical telegrapher or electrician; such detail for instruction shall not excuse any one from attendance at company drills or parades or any other company duty.

"4. Previous to the annual encampment there shall be chosen in each regiment, from those selected for instruction in signaling, one lieutenant and one non-commissioned officer, and from each company one private, who shall compose the signal corps of said regiment.

"5. There shall also be selected by examination during the annual encampment, or immediately preceding, a signal corps for the Indiana Legion, which shall be composed of one lieutenant, two non-commissioned officers, and eighteen privates, the privates to be selected equally from each regiment or battalion organization.

"6. The names of those detailed for instruction in signaling must be forwarded on or before April 15, 1890, to the adjutant-general of the State of Indiana, through the regular military channels."

* * * * * * *

Relative to the furnishing of equipments to the National Guard, it is a matter of much regret that not only is this service without authority to issue, but the attempt of various States interested to secure legislation from the present Congress that would enable them to purchase from the Government standard signal equipments at cost price was unsuccessful, and the only practicable method of putting signal equipments into the field with State troops is through the assignment of a regular officer, who shall be responsible.

Very respectfully, your obedient servant,

R. E. THOMPSON,
First Lieutenant, Sixth Infantry, Signal Officer.

The CHIEF SIGNAL OFFICER,
U. S. Army.

APPENDIX 2.

REPORT OF THE OFFICER IN CHARGE OF TELEGRAPH DIVISION.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, June 30, 1890.

SIR: The officer in charge has the honor to submit the following report regarding the telegraph division for the past fiscal year:

PERSONNEL.

Second Lieut. James Mitchell, Signal Corps, signal officer, has continued in charge of the division, except during the month of July, when he was absent with leave, and the duties were temporarily performed by Second Lieut. Frank Greene, Signal Corps, signal officer.

The force at this office, besides the officer in charge, consists of one sergeant of the Signal Corps, and eight civilians.

Mr. Robert Seyboth, chief clerk of the subdivision embracing the administration of the military and sea-coast telegraph lines, has, as in former years, rendered excellent service. His extensive knowledge of electricity as applied to telegraphic work, his past experience and practical training as operator, repairman, and line constructor, his thorough familiarity with the details regarding the respective lines, the laws that govern them, etc., and his good judgment, ability, and discretion, eminently fit him for the position; and the present officer in charge takes pleasure in acknowledging the value of his general services and the excellent practical suggestions offered in the interests of economy and good administration on questions demanding executive action.

Sergeant J. H. Robinson has continued as chief operator. He also is excellently suited to the position. His long practical training and experience as an operator in the line of his profession; his familiarity with telegraph and telephone routes, customs, modes of business, etc.; his knowledge of line construction, materials, instruments, and batteries, and above all his thorough acquaintance with modes of collecting and distributing weather reports and telegrams, both over military and sea-coast telegraph lines and those of commercial companies. in accordance with special agreements; his ripe knowledge of the necessities of the service in connection; his good judgment, discretion, and quickness of perception that often prompt to take advantage of modes of obtaining important reports in times of line trouble, etc., and his ability as an accountant, render his services of unusual value to the corps. His conduct and general management, both of the operating-room and the work committed to his charge, have been most satisfactory.

The subordinate force of the operating-room consists of six civilian operators and one battery man. Four of the operators were formerly enlisted men in the Signal Corps, discharged in accordance with law when the office force, with a few exceptions, became civilian, who served long and faithfully, and whose past experience and training in Signal Service methods render them the better fitted for their present work. The two others have been assigned during the year to replace men who obtained transfers to other Government bureaus, with a view to advancing their personal interests.

In addition to their regular duties, the operators are required to audit accounts for telegraphic and telephonic services, which entails much labor and responsibility. These duties have been materially augmented during the past year, as the Western Union Telegraph Company, which performs the greater part of the telegraph service, has officially signified its intent not to accept the reduced rates for Government telegrams annually fixed, in accordance with law, by the honorable Postmaster-General, and it became advisable, in order to prevent complications regarding the expenditure of appropriations until a definite settlement is had of the pending question and to afterwards permit prompt payment, to audit accounts, both in accordance with the new legal tariff and that which formerly obtained.

The conduct and services of the operators have been excellent throughout the year. In this connection the dual nature of their work and also its character deserve consideration. As operators they handle important public telegrams, mainly regarding weather reports, the majority in cipher, which require correctness of the highest order, rarely, to their credit, making mistakes, and exhibiting great tact and skill, especially in modes of expediting current work, both in the interests of this service and the public; for any error or delay in handling telegrams would cause a corresponding delay in the issue of the forecasts to the country, and in the ordering of signals to forewarn of frosts, storms, etc., and might thereby cause disaster, and often endanger life and property. As accountants, they are charged with auditing bills for settlement of telegraph and telephone services, and as the amounts to be paid range from $8,000 to $10,000 per month, the responsibility in connection must be obvious.

The battery man was assigned in that capacity on October 1, 1889, having been previously employed as a laborer. He has rendered good and faithful service, both in his proper sphere, and also in the construction of office lines and in matters of general utility relating to telegraph work. His conduct has been excellent and the performance of his duty very satisfactory.

The officer in charge considers it his duty most respectfully to invite the Chief Signal Officer's attention to the character of the respective duties performed as above set forth, and the compensation paid for such services, especially as compared with that paid in other Government bureaus for labor much less important and involving little responsibility. The importance to the interests of this service of retaining men of experience and ability, who have been practically trained in their duties, can not be overestimated; but it is respectfully submitted that, as has already been proven by experience, transfers will be sought and obtained to other bureaus offering better oppportunities for advancement except more satisfactory inducements than those that now obtain can be offered in this service.

It is worthy of note also in this connection that the operating force is on duty every day in the year, Sundays and holidays included; though their work on these days has been restricted by the present Chief Signal Officer to the performance only of what is actually necessary.

The force serving outside of Washington consists, at the close of the fiscal year, of 60 enlisted men of the Signal Corps and 18 civilians; all on duty on the military and sea-coast telegraph lines. In addition to their regular duties as operators and repairmen they are also utilized in connection with meteorological work. Thirty-seven of the enlisted men and two of the civilians perform the meteorological duties of second-order stations, which comprise taking and recording two full observations daily and other incidental labor. Nineteen enlisted men take and record one observation daily and perform the minor labor in connection devolving on third-order stations; and 4 enlisted men and 16 civilians make and record one daily observation of rainfall. These employés have in general performed their duties satisfactorily. The enlisted men especially deserve much commendation. Most of them, from the character of their work, are stationed at isolated points, where they have long monotonous hours of duty, including every day of the year, though the work is restricted on Sundays and holidays to only what is necessary; where only, as a rule, the mere necessaries of life can be obtained, and often at much personal expense; where there is little, if any, opportunity for social intercourse or the enjoyment of even the ordinary comforts of life; and where, often in the most unfavorable weather, they are subjected to personal hardships in making extended line trips to keep up communication, frequently at the risk of health, and occasionally even of life itself. The value of their services, both to military and commercial interests, is well known to the Chief Signal Officer, and needs no extended eulogy.

The present Chief Signal Officer has already reduced, as far as practicable in public interests, their hours of labor, and otherwise endeavored to ameliorate their condition, and will doubtless show them such further consideration as may be just and practicable.

WORK OF THE DIVISION.

The work of the division has remained substantially the same as in former years, and has comprised mainly the administration and supervision of the United States military and sea-coast telegraph lines, in their maintenance, operation, and repair; the test and inspection of telegraph material and instruments purchased for the Service; the telegraphing of weather reports and official messages to and from the central office and to and from subordinate centers for collection and distribution, and the auditing of all bills for services rendered in transmitting data by commercial telegraph companies.

During the past fiscal year the general telegraph service has been more satisfactory than in former years.

At the central office alone, within the year, there were received and sent 1,200,000 cipher words, comprising weather reports, and 80,000 miscellaneous telegrams. There were also audited ninety-five bills for telegraph services, leaving about sixty additional which have not been presented for settlement, as several of the companies decline to accept the rates fixed by the Postmaster-General.

CIRCUITS.

The circuit system, so advantageous in former years to the Service in transmitting weather reports, still obtains, and has been somewhat extended during the year. By this arrangement, which permits intermediate stations to receive weather reports passing between the terminal offices on a circuit, the distribution of reports is greatly expedited, at reduced labor and cost, as one transmission supplies all intermediate points. There are now twenty-three circuits in operation, varying in length from 62 to 1,112 miles, and each designated by the names of the terminal stations, as "Alpena and Detroit," "Cairo and St. Louis," etc.

MILITARY AND SEA-COAST TELEGRAPH LINES.

There were in operation at the date of the last report 1,615 miles of military lines and 621 miles of sea-coast lines. The policy of the Chief Signal Officer to discontinue these lines wherever commercial lines are ready to do the work, or where the lines are no longer required for strictly military purposes, led to the abandonment of 365 miles of military lines during the year, as hereinafter referred to in detail; while the prospective discontinuance of a number of military posts, as contemplated in General Orders, No. 43, Adjutant General's Office, current series, will result in the abandonment of 263 miles of line additional at an early date. Two new lines, aggregating 87 miles in length, were constructed during the year in the interest of shorter and more reliable outlets for existing lines. In both cases the material was recovered from old lines, and the work of construction done by troops without extra expense to the United States. No change has taken place in the mileage of the sea-coast lines in operation at the beginning of the year, but steps have been taken to extend the San Francisco—Point Reyes line via Lime Point and Tiburon—in accordance with an act of Congress to that effect.

The following table shows the location of the lines by departments and coasts, together with their length and the changes during the year:

I. MILITARY LINES.

Departments.	In operation. July 1, 1889.	In operation. June 30, 1890.	Changes.
	Miles.	*Miles.*	
Dakota	282	282	No change.
Missouri	230	126	Abandoned 108 miles, Fort Reno to Woodward; built 4 miles, Fort Reno to El Reno.
Texas	124	124	No change.
California	12	12	No change.
Columbia	99	0	Abandoned 99 miles, Fort Klamath to Ashland.
Arizona	540	493	Abandoned 130 miles, Whipple Barracks to Phœnix; built 83 miles, Fort Apache to Holbrook.
Platte	328	300	Abandoned 28 miles, Fort Laramie to Bordeaux.
Total	1,615	1,337	Total decrease 278 miles.

II. SEA-COAST LINES.

Pacific coast	158	158	No change.
Atlantic coast	463	463	No change.
Total	621	621	

These lines are divided into 31 separate circuits, with 91 offices and suboffices, of which 20 circuits and 67 offices are authorized to carry commercial business at the rates fixed by the Secretary of War, while the remaining 11 sections and 24 offices are mostly operated as telephone lines, under the immediate control of the post authorities, and carry no paid business.

TELEGRAPH RATES.

The business of all Departments of the Government and the personal messages of officers of the Army, and of such persons as have been granted "franks" by the Chief Signal Officer, are transmitted free of charge over the military and sea-coast lines.

The rates for commercial messages over these lines are at present as follows:

On lines exceeding 400 miles in length, 20 cents for each message of ten words and 1 cent for each additional word.

On lines from 150 to 400 miles in length, 15 cents for each message of ten words and 1 cent for each additional word.

On all lines less than 150 miles in length, 10 cents for each message of ten words and 1 cent for each additional group of two words or fraction thereof.

The total receipts accruing to the United States from the transmission of commercial messages during the year amounted to $7,187.24.

OFFICERS ON DUTY WITH TELEGRAPH LINES.

The following named officers of the Signal Corps have been in charge of divisions of military and sea-coast telegraph lines during the year, viz:

Second Lieutenant James A. Swift, in charge of lines in the Department of the Columbia from July 1 to November 2, with station at Ashland, Oregon. In charge of lines on the Atlantic coast from December 10 to March 15, with station at Norfolk, Va.

Second Lieutenant William A. Glassford, in charge of lines in Arizona Territory from July 1 to October 7, with station at Whipple Barracks, Arizona.

Second Lieutenant William D. Wright, in charge of New England Division, sea-coast lines, July 1 to September 30, with station at Wood's Holl, Mass.

Second Lieutenant Frank Greene, temporarily in charge of lines in Texas, New Mexico, Indian Territory, Utah, Wyoming, Dakota, and Montana from August 1 to September 30, station at this office. Lines in Arizona October 8 to present date; and, in addition, lines in Texas, Indian Territory, and New Mexico since May 16, with station at Whipple Barracks, Arizona.

Second Lieutenant John C. Walshe, in charge of lines in North Dakota, Montana, Utah, and Wyoming, January 21 to present date; and, in addition, lines in Washington and Oregon since May 1; station at Bismarck, N. Dak.

Second Lieutenant Benjamin M. Purssell, in charge of lines in Dakota, Montana, Utah, and Wyoming, October 1 to January 20; station at Bismarck, N. Dak.

Second Lieutenant John P. Finley, in charge of Atlantic Division, sea-coast lines, from October 1 to December 9; station at Boston, Mass.

Second Lieutenant Joseph E. Maxfield, in charge of Point Reyes lines from July 1 to June 30; station at San Francisco, Cal.

Second Lieutenant Frank W. Ellis, in charge of lines in Texas, New Mexico, Indian Territory, Utah, Wyoming, and Dakota from July 1 to 31, with station at San Antonio, Tex. Lines in Texas, New Mexico, and Indian Territory, October 1 to May 9; station at Galveston, Tex. In charge of Atlantic Division, sea-coast lines, May 21 to present date, with station at Norfolk, Va.

In addition to their regular duties with the lines mentioned these officers have been engaged from time to time in inspecting the various signal stations in neighboring States and Territories. Lieutenant Greene was also employed in supervising the recovery of the material from the abandoned line between Whipple Barracks and Phœnix, the construction of the new lines from Fort Apache to Holbrook, and the reconstruction of the line between San Carlos and the "Summit."

OFFICE HOURS.

To prevent unnecessary duty by the excessive lengthening of office hours and to establish uniform rules for meeting public needs, it was ordered on December 2 that offices on the military telegraph lines should be open to the public from 9 a. m. to 4 p. m. and from 7 p. m. to 8 p. m., except on Sundays and holidays, unless these hours should be temporarily changed by competent authority in cases of military emergency. (General Order No. 31, 1889.) On Sundays and legal holidays the hours of business are restricted to the minimum consistent with the public requirements on those days. (General Order No. 32, 1888.)

On the sea-coast lines the regular office hours were fixed to be from 8.30 a. m. to 7.30 p. m. for stations where two or more men are on duty, and from 9 a. m. to 4 p. m. for stations where there is but one man. In the same order the special duties pertaining to stations on these lines were redefined, in a modified form, to meet the altered conditions since the original instructions were issued. (General Order No. 6, 1890.)

VESSEL REPORTS.

As it was brought to the attention of the Chief Signal Officer that operators on the sea-coast lines were frequently called upon outside of their regular office hours to expend extra time and labor in reporting passing vessels, often at unseasonable hours, in the interests of private corporations and individuals, he considered it but just that, while no compensation should be demanded or accepted for reporting vessels during the prescribed office hours, operators who choose to give a part of their own time to this purpose should be permitted to receive a reasonable remuneration for so doing. Accordingly on February 6, 1890, operators were advised that they would be permitted to make such arrangements with corporations and individuals regarding compensation for their extra time and labor as might be mutually satisfactory; but that no arrangement should be entered into or considered as authorized unless it had first been submitted to and approved by the Chief Signal Officer.

REPORTS OF FUNDS—CASH-BOOKS.

In view of the diminished cash receipts at most offices on the military and sea-coast telegraph lines, officers in charge were authorized on December 9, 1889, to entirely discontinue, in their discretion, the weekly statements of funds (Forms Nos. 44 and 45) from stations where the receipts were known to be small, and to require them to be rendered only at the close of business on the 15th day of each month in other cases.

The methods of keeping cash-books, and maintaining proper checks on the transfer of line receipts, were amended and improved in the interests of accuracy and security against loss to the United States from carelessness or otherwise. (General Orders Nos. 12 and 13, 1890.)

WESTERN UNION TOLLS ON OFFICIAL TELEGRAMS.

The Western Union Telegraph Company having announced its intention to decline the rates fixed by the Postmaster-General, the operators in charge of all military offices were instructed not to collect that company's tolls on official messages, but to turn such messages over to the company for collection. This action prevented complication and embarrassment in the settlement of transfer accounts. (Circular letters, Telegraph Division, December 10 and February 1.)

RULES GOVERNING FREE BUSINESS.

In connection with Circular No. 19 of 1883, from this office, providing for the free transmission over Signal-Service lines of the personal messages of all officers of the Army, it was ordered on August 12, 1889, that thereafter free private messages should only be sent when it could be done without detriment to public and paid business, and without causing operators to work extra hours or ask for additional force. This action became necessary on account of the large and increasing number of private messages offered for free transmission over some of the lines, and to prevent interference with the proper dispatch of public business, and any further increase in the operating force not warranted by the amount of official or paid business. (Circular letter, Telegraph Division, August 12, 1889.)

CABLE ARRESTERS.

To better protect the submarine cables in use by this service from damage by lightning, the "Swift" cable arrester was experimentally replaced on a number of lines by a modified form of the double circular-plate arrester, with rubber rings and spider wire. As the new arresters were not distributed until last January, their supposed superiority has not yet been put to a sufficient number of practical tests to warrant a final opinion. Reports will be called for later in the year, when sufficient data will probably be available to decide the question.

MILITARY AND SEA-COAST TELEGRAPH LINES.

A brief history and description of the several sections of military and sea-coast telegraph lines, with changes since date of last report, is furnished as follows:

MILITARY LINES.

Department of Dakota.—No important changes have taken place in the lines of this department, but steps have been taken to abandon early in July the 186 miles of line from Fort Maginnis to Kintyre on the discontinuance of the post of Fort Maginnis. This will close three stations, release one Signal Corps man, and admit of the discharge of two civilians. Despite its weak condition, as reported last year, the Fort Maginnis line has worked well, and all faults occurring were repaired with commendable promptness.

The Fort Custer section received general repairs by troops during July, when 145 cedar poles were put into the line. Two hundred iron poles are now on the way to Custer Station, which will probably suffice to put the line in good order for several years.

The Bismarck-Fort Yates line has remained in efficient working order.

The Fort Totten-Oberon telephone line remains under the control of the post authorities. It carries no paid business.

The Signal Corps observers at Forts Sully, Buford, and Assinniboine operate Western Union lines or loops to the nearest commercial offices, by which arrangement the prompt transmission of "signals" and other official business is secured without additional expense.

Department of the Missouri.—Owing to the extension of a railroad line to a point within a few miles of Fort Reno, Ind. T., it became possible to discontinue 108 miles of line between that post and Woodward, by building a short line between the post and the railroad station at El Reno, a distance of about 4 miles. This connection was completed on April 19, part of the old line having been dismantled for the purpose of supplying the necessary material. The remainder of the line as far as Cantonment, 62 miles, was turned over to the Interior Department for the use of the Indian Bureau; and from Cantonment to Woodward the iron poles were recovered by troops, and the rest of the material sold at auction. This change divides the Indian Territory lines into two separate sections, one from Fort Sill via Fort Reno to El Reno, 79 miles, and the other from Fort Supply to Woodward, 15 miles. The latter section has been equipped as a telephone line and transferred to the post authorities, to date July 1, 1890.

The Fort Elliott-Miami and Fort Lewis-Durango lines have remained in operation as described in the last report.

Department of Texas.—No change has taken place except that the Rio Grande City office was moved to Fort Ringgold, where the necessary accommodations are obtained without expense. The line thence to Brownsville has remained in effective operation.

The telephone line from Fort Davis to Marfa is operated under the control of the post authorities. The observer at San Antonio operates a loop between department headquarters and the Western Union office.

At the request of the department commander, approved by the Secretary of War, sufficient old line material, instruments, etc., were furnished by this office for the construction of a line from Fort Clark to Spofford Junction, a distance of about 10 miles. The shipments were ordered on June 18.

Department of California.—The broken cable between Fort Mason and Alcatraz Island was repaired August 21, at a cost to this Service of $275 for such appliances and skilled labor as could not be furnished by the military authorities. About one and one-half miles of the old cable was recovered at the same time. The cable was again broken on November 7 (for the sixth time), and in view of the evident impracticability of maintaining a cable over that route no further attempts were made to repair it. By employing the Western Union operator at Tiburon to transfer the business for the islands via Angel Island telegraphic communication has been maintained; and under the act of Congress providing for the renting of a conductor in the Western Union cable across the Golden Gate, and the construction of a connecting land line, direct communication with Angel Island and Alcatraz Island will be restored at an early date. The cable between these two islands was accidentally broken by an anchor on August 21. It was raised and repaired at the expense of the vessel's owners.

Department of the Columbia.—The line from Fort Klamath to Ashland, Oregon, which was mentioned last year as requiring extensive repairs, was abandoned and sold November 2, before any action had been taken to reconstruct it. This resulted from the withdrawal of the garrison from Fort Klamath. The Fort Canby section is referred to under sea-coast lines.

Department of Arizona.—The operation of the line from Whipple Barracks to Phœnix, 130 miles, was discontinued early last July, and the line advertised for sale; but at the request of the department commander the Secretary of War directed that the material be recovered by troops and utilized in the construction of a line from Fort Apache to Holbrook. The work of dismantling the old line and constructing the new one was done by troops under the supervision of Second Lieut. Frank Greene, Signal Corps, and was completed March 4, 1890. The new line is 83 miles long, and furnishes an additional outlet for the important posts on the Apache line. The old line from San Carlos to the "Summit" was dismantled during May, and rebuilt along the new road under the supervision of Lieutenant Greene.

The line between Fort McDowell and Phœnix was equipped with telephones and transferred to the post commander on January 1. This section, as well as the Prescott-Verde line, will shortly be discontinued under the provisions of General Orders No. 43, Adjutant-General's Office, current series.

The Fort Lowell-Tucson telephone line continues in operation as described last year.

The Fort Stanton section, in the District of New Mexico, has remained in good working order, although in the absence of an intermediate repair station the removal of ordinary faults is apt to involve vexatious delays. A quantity of new wire and 100 iron poles have been ordered, shipped to Lava for use in making general repairs, and the department commander has directed that troops and transportation be furnished from Fort Stanton for that purpose.

The Fort Union and Fort Wingate sections remain under the control of the respective post commanders.

Department of the Platte.—The repair station at Sweetwater Bridge, Wyo., on the Fort Washakie line, was closed during August with the concurrence of the post commander, and the repairman moved to Fort Washakie. Serious delays in making repairs occurred during April and May, owing to the failure of the post authorities to send out repair parties. As the line is maintained strictly in the interests of the post, and with the distinct understanding that repairs should be made by troops, it is presumed that those interests were not of sufficient importance at that time to demand more energetic action in restoring communication. The suboffice at Lander is still maintained for the benefit of the citizens, and without expense to this service.

Twelve hundred iron poles have been shipped to Price, Utah, for use on the Fort Du Chesne line, and the department commander has directed that the work of making general repairs be begun immediately on the arrival of the last invoice of poles from the Indian Territory; troops and Government transportation to be furnished from Fort Du Chesne. The line has been maintained in very efficient working order considering the rough nature of the ground, and its liability to damage from cattle and freighters.

The arrangement for the joint operation of the Fort McKinney and the Wyoming Inland Telegraph Company's lines to Douglas has continued with fairly satisfactory results. The company has repeatedly endeavored to dispose of its line to the Government or obtain an order that troops should keep it in repair. Neither position was favorably considered by the Secretary of War. General repairs were made by troops during April.

Owing to the abandonment of the post of Fort Laramie, the telephone line from that post to Bordeaux, Wyo., was discontinued on December 4, 1889. The iron poles were recovered for use on the Fort Du Chesne section and the rest of the material offered for sale at auction.

The Fort Bridger line will shortly be abandoned under the provisions of General Orders, No. 43, Adjutant-General's Office, already referred to.

SEA-COAST LINES.

Atlantic Division.—Excepting the unavoidable delays attending the repairs to the Cape Charles and Nantucket cables, there has been but little interruption of business on these lines. Extensive general repairs were made on portions of the Hatteras line, including the erection of 300 new wooden poles, the stringing of 25 miles new wire, and the lengthening of the cable ends at Oregon Inlet and New Inlet. The Cape Charles cable failed on September 1, and was subsequently found to have been cut with an ax, presumably by the crew of some vessel whose anchor had fouled the cable. Bad weather and other causes prevented repairs until October 20, when they were skillfully made by Private William Daly of the Kitty Hawk station, at an expense of $585 for hire of boat and appliances. To facilitate repairs on the Hatteras section, an additional station was opened on the line, at Currituck Inlet, North Carolina, with good results. It is estimated that to put the section in first-class condition 100 miles of new wire and 200 wooden poles should be furnished during the coming year.

The Nantucket lines have worked efficiently, and the expectation that the new cable across Vineyard Sound would be safe from damage by anchors has thus far been fully realized. A slight leak appeared in this cable during July and was located in the splice near Gay Head; but communication was not interrupted thereby, and the splice was made over during August. The cable between Martha's Vineyard and Nantucket failed on December 2, and was promptly repaired by Sergeant Blundon on the 15th day of the same month. This trouble was also found to have been caused by an old splice. A discreditable interruption of business occurred during the latter part of December, due to the neglect and incompetency of the Woods Holl repairman, who was promptly reduced and transferred to another station. The few iron poles that still remain in use should be replaced with wooden ones during the coming year; otherwise the section is in good condition.

The Block Island and Wilmington sections have remained in excellent working order.

On the Jupiter line occasional ordinary repairs have been sufficient to maintain efficient service; a general trimming out of trees and other foliage will probably be the only extra expense necessary during the coming year. Besides the three regular stations on this line, suboffices have been in operation for the benefit of local interests, and without expense to the United States, at Eau Gallie, City Point, Rockledge, Melbourne, and Fort Pierce.

Pacific Division.—General repairs were made on the Fort Canby section during November, including the erection of 32 new poles. The land line has been in good condition since; and no trouble whatever has thus far appeared in the new Columbia River cable laid in 1888.

Owing to the break in the Alcatraz cable, as mentioned elsewhere, the direct operation of the Point Reyes line from the San Francisco office had to be discontinued; but the weather and vessel reports from Point Reyes were received as usual by transferring them to the commercial lines at Tiburon. The deficiency bill passed by the present Congress provides for the rental of a conductor in the Western Union cable across the Golden gate, and the construction of a land line connecting that cable with the present terminus of the Point Reyes line. Work on the latter is now under way, and will restore direct communication between the signal office at San Francisco and the light-house at Point Reyes, when completed. Severe storms during January did considerable damage to the line, and necessitated general repairs.

The Tatoosh Island section was kept in operation between Port Angeles and Neah Bay until December, when the poor condition of the line necessitated its provisional abandonment until the action of Congress should determine either the complete restoration of the section, including a new cable to Tatoosh Island, or its permanent abandonment. A bill appropriating $6,800 has passed the Senate and been favorably reported to the House, which contemplates the renewal of the cable and line; but it is believed that this sum will be insufficient for purchasing so heavy cable as the one recommended by the Board, not to speak of the considerable sum that will be required to rebuild the land line. It has been suggested that a wire span across the narrowest part of the channel (about three-fourths of a mile wide there) might be maintained in lieu of a cable; and as the high bluffs on both shores afford superior advantages, it is possible that a suitable structure could be erected at a comparatively small cost to safely carry a proper conducting wire under ordinary conditions and without interfering with the navigation of the channel. Whether the span would also withstand the violent wind-storms for which this locality is noted, especially during winter, if coated with snow or sleet, or possibly spray, should the sag be great at certain points, is a subject for further consideration, and perhaps experiment; but the plan might be used as an alternative, especially in view of the small cost involved, should Congress fail to make appropriation for restoring communication by cable.

Respectfully submitted.

JAS. MITCHELL,
Second Lieutenant, Signal Corps, Telegraph Officer.

The CHIEF SIGNAL OFFICER.

APPENDIX 3.

ANNUAL REPORT OF THE CHIEF OF THE CORRESPONDENCE DIVISION.

SIGNAL OFFICE, WAR DEPARTMENT, *Washington City, July* 1, 1890.

SIR: Following is a report of the work of the Correspondence Division for the year ending June 30, 1890, with information connected therewith:

GENERAL AND SPECIAL ORDERS ETC., ISSUED.

General orders and circulars printed	42
Copies and extracts distributed	18,133
Special orders (mimeographed) 157; and 6,201 copies distributed	6,358
Instructions (mimeographed) 49; and 1,648 copies distributed	1,697
Memorandums issued, 90; and 291 copies distributed	381
Total	26,611

ENLISTMENTS, DISCHARGES, EXAMINATIONS OF RECRUITS, ETC.

Enlisted men, Signal Corps, appropriated for	320
Enlisted men, Signal Corps, on July 1, 1889	315
Enlisted men, Signal Corps, on June 30, 1890	318
Discharged during year on account of—	
Expiration of term	46
Their own applications	23
Unsatisfactory conduct	6
Died during the year	7
Re-enlisted immediately after discharge	41
Out of Signal Service for some time, who sought and obtained re-enlistment	7
Recruits enlisted	37
Promotions during year	50
Reductions during year	5
Applicants for enlistment during year	311
Candidates who were examined as to education—	
Passed	43
Failed	25

MUSTER ROLLS, RETURNS, VOUCHERS FOR PAY, ETC., PREPARED.

Muster rolls, enlistment returns, signal officers' returns (sheets)	336
Enlistment papers	170
Discharge certificates	75
Furloughs	16
Final statements of pay, etc., of enlisted men discharged	164
Vouchers for pay and commutation	7,680

Card records of civilian employés and enlisted men, on which are entered, for ready reference, jottings of everything relating to the efficiency, etc., of each, have been kept up.

ABSENCE OF EMPLOYÉS, SIGNAL OFFICE, WASHINGTON CITY.

Employés.	Average number.	Total absence.		Average absence.	
		With leave.	On account of sickness.	With leave.	On account of sickness.
		Days.	*Days.*	*Days.*	*Days.*
Male	148	4,039	877	24.45 *24.50	5.28 *4.50
Female	20	628	174	26.17 *25.50	7.25 *11.00

There was a total absence of 30½ days without pay (351 days in 1888-9).

WAR RECORDS.

From January, 1882, to June 30, 1889, 466 calls were received and reported on, in cases of claims for pensions, etc.; 61 calls were received and reported on during the past year.

The preparation of a military history, or card containing a synopsis of everything of record in this office, for every officer and man in Signal Service during the war was nearly completed the past year; but the necessity of devoting all available clerical force to examining several hundred thousand letters, with a view to sale of the worthless for waste paper, required by recent action of Congress, will necessitate a temporary suspension of this work. It will, however, be completed during the current year, probably. As an instance of the facility with which information in such cases can now be secured and furnished, reference is made to the fact that on one occasion during the year two calls for reports were received from the Adjutant-General's Office, in the mail at 9 o'clock a. m., and at 10 o clock the same morning both were returned with a report, in each case, of the facts of record in this office as to the war service of the men. Report is made in every case within twenty-four hours (where Sunday or holiday does not intervene) of date of receipt of the call for information.

BUSINESS METHODS—CLERKS.

During the year every effort has been made to do the clerical work in a manner approximating, in so far as safety to the Government interests will allow, the simple and expeditious course pursued by private individuals who are forced to consider the cost. It is not considered necessary to give particulars of the changes in details made with this object; but the extent to which the effort has been successful is indicated by the fact that but half the time of one clerk has been taken in preparing the vouchers, etc., for the pay of enlisted men (covering nearly half of the total disbursements for the service), and the additional fact that three clerks, named below, could be spared from a division which has been undergoing gradual reduction for some years past. The necessity for the improvement in this direction is forcibly brought to mind by the authorization by Congress of the sale as waste paper of certain useless documents in the Departments, under which about 600,000 letters received in this office will be selected for disposal as no longer of value. A low estimate of the cost to the United States of the mere clerical work of briefing and recording the briefs of these letters, as distinct from the cost of considering and ordering action thereon, would place it above $100,000. Most of this money was uselessly expended under a system by which papers on the most trivial subjects were carefully and elaborately briefed and recorded. This expensive and profitless system was discontinued in this office in 1887.

In this connection it is considered proper to remark that the best work can be expected only from clerks who are well paid. It is well known that the rates of pay are lower in this office than in other bureaus and departments; hence dissatisfaction and a constant desire to get transferred exists. There are clerks in the correspondence division worth more than the $1,200 per annum they receive. It would be to the interest of the Government to give them better salaries; for, no matter how close the super-

*Average for preceding year (1888-89).

vision of the chief, underpaid clerks can, and sometimes do, perform their work in a perfunctory and indifferent manner. Knowing that on account of their experience as clerks they can readily secure the same rate of pay, with prospects of advancement, in other bureaus, there is no means of exacting better work, as the option of resigning and securing appointment elsewhere is always open. On the other hand, if paid salaries equal to those in other Departments, they would repay many fold the increase of salary by a hearty and interested performance of duty. The fear of reduction or dismissal could be brought to bear on the very few who would require such treatment to exact the very best work they are capable of.

Three efficient clerks were lost (two, M. F. Holland and G. H. Davis, by resignation, and one, J. D. Parker, by transfer to Accounts Division) by the division during the year. They have not been replaced. Of those now in the division 5 were not absent on account of sickness, and the other 5 only 46½ days, an average for the whole of 4.65, which is below the general average.

The undersigned continued in charge of the division during the year.

LETTERS RECEIVED AND LETTERS SENT.

A card-index system, in place of Letters Received Record books, for the important letters in Correspondence Division, was commenced on January 1st, and work under it is done more expeditiously and economically.

During the year 19,938 letters received, including inclosures, and 32,871 letters sent were entered and copied, etc., respectively, in the Correspondence Division.

Following is the number of communications, etc., sent from and received in all divisions of this office during the year:

Communications received, including inclosures and meteorological forms	289,825
Communications sent, including orders, etc., distributed	73,604
Bulletins, weather maps, and other publications distributed from Washington	268,952
Total	632,381

Telegrams:	
Cipher words of reports sent and received	1,200,000
Telegrams other than weather reports sent and received	80,000

Very respectfully,

J. B. McLaughlin,
Chief of Correspondence Division.

The Chief Clerk, Signal Office,
Washington, D. C.

Respectfully submitted.

O. A. Nesmith, *Chief Clerk.*

The Chief Signal Officer.

Stations Inspected during Fiscal Year ending June 30, 1890.

Stations.	By whom.	Date.
Albany, N. Y	Lieut. J. P. Finley, Signal Corps	Dec. 20–22, 1889.
Atlantic City, N. J	do	Jan. 7, 8, 1890.
Alpena, Mich	Lieut. F. M. M. Beall, Signal Corps	Dec. 5, 6, 1889.
Assinniboine, Fort, Mont	Lieut. J. C. Walshe, Signal Corps	May 1, 2, 1890.
Auburn, Ala	Lieut. R. E. Thompson, Sixth Infantry, signal officer.	Feb. 14, 1890.
Atlanta, Ga	do	Feb. 15, 16, 1890.
Augusta, Ga	do	Feb. 17, 18, 1890.
Abilene, Tex	Lieut. F. W. Ellis, Signal Corps	Mar. 29, 30, 1890.
Boston, Mass	Lieut. J. P. Finley, Signal Corps	Dec. 6–9, 1889.
Buffalo, N. Y	do	Dec. 28–30, 1889.
Block Island, R. I	do	Jan. 21, 22, 1890.
Bismarck, N. Dak	Lieut. J. C. Walshe, Signal Corps	June 13, 14, 1890.
Buford, Fort, N. Dak	do	Apr. 28, 29, 1890.

STATIONS INSPECTED, ETC.—Continued.

Stations.	By whom.	Date.
Baltimore, Md	Lieut. R. E. Thompson, Sixth Infantry, signal officer.	Jan. 6-8, 1890.
Brownsville, Tex	Lieut. F. W. Ellis, Signal Corps	Apr. 27, 28, 1890.
Bowie, Fort, Ariz	Chief Signal Officer	May 6-8, 1890.
Chicago, Ill	Lieut. F. M. M. Beall, Signal Corps	Nov. 23-26, 1889.
Custer, Fort, Mont	Lieut. J. C. Walshe, Signal Corps	May 14, 15, 1890.
Cincinnati, Ohio	Lieut. R. B. Watkins, Signal Corps	Nov. 29, 30; Dec. 2, 1889.
Cleveland, Ohio	do	Dec. 19-21, 1889.
Columbus, Ohio	do	Dec. 26-28, 1889.
Cairo, Ill	do	Jan. 6, 7, 1890.
Do	Lieut. F. R. Day, Signal Corps	June 29, 1890.
Chattanooga, Tenn	do	Jan. 14, 15, 1890.
Cape Henry, Va	Lieut. R. E. Thompson, Sixth Infantry, signal officer.	Jan. 10, 11, 1890.
Charleston, S. C	do	Jan. 15, 16, 1890.
Cedar Keys, Fla	do	Jan. 24, 1890.
Columbia, S. C	do	Feb. 19, 1890.
Charlotte, N. C	do	Feb. 20, 1890.
Colorado Springs, Colo	Lieut. F. R. Day, Signal Corps	Mar. 10, 11, 1890.
Cheyenne, Wyo	do	Mar. 13, 1890.
Concordia, Kans	do	Mar. 15, 16, 1890.
Crete, Nebr	do	Mar. 17, 1890.
Columbia, Mo	do	Mar. 23, 1890.
Corpus Christi, Tex	Lieut. F. W. Ellis, Signal Corps	May 2, 3, 1890.
Detroit, Mich	Lieut. F. M. M. Beall, Signal Corps	Dec. 15, 16, 1889.
Duluth, Minn	Lieut. J. C. Walshe, Signal Corps	Dec. 1, 2, 1889.
Des Moines, Iowa	do	Dec. 13, 14, 1889.
Davenport, Iowa	do	Dec. 17, 18, 1889.
Dubuque, Iowa	do	Dec. 19, 20, 1889.
Dodge City, Kans	Lieut. F. R. Day, Signal Corps	March 7, 1890.
Denver, Colo	do	Mar. 11-13, 1890.
Do	Chief Signal Officer	May 14, 1890.
Davenport, Iowa	Lieut. F. M. M. Beall, Signal Corps	June 28, 29, 1890.
Eastport, Me	Lieut. J. P. Finley, Signal Corps	Dec. 13-16, 1889.
Erie, Pa	Lieut. R. B. Watkins, Signal Corps	Dec. 14-17, 1889.
Elliott, Fort, Tex	Lieut. F. W. Ellis, Signal Corps	Mar. 22, 23, 1890.
Fort Smith, Ark	do	Mar. 14, 15, 1890.
Fresno, Cal	Lieut. J. P. Finley, Signal Corps	June 21, 22, 1890.
Green Bay, Wis	Lieut. F. M. M. Beall, Signal Corps	Nov. 30; Dec. 1, 1889.
Grand Haven, Mich	do	Dec. 9, 10, 1889.
Galpin, Mont	Lieut. J. C. Walshe, Signal Corps	Apr. 30, 1890.
Galveston, Tex	Lieut. F. W. Ellis, Signal Corps	Apr. 2, 3, 1890.
Harrisburg, Pa	Lieut. J. P. Finley, Signal Corps	Jan. 2, 3, 1890.
Huron, S. Dak	Lieut. J. C. Walshe, Signal Corps	Dec. 8, 9, 1889.
Helena, Mont	do	May 3, 4, 1890.
Ithaca, N. Y	Lieut. J. P. Finley, Signal Corps	Dec. 31, 1889; Jan. 1, 1890.
Indianapolis, Ind	Lieut. R. B. Watkins, Signal Corps	Dec. 30, 31, 1889.
Jacksonville, Fla	Lieut. R. E. Thompson, Sixth Infantry, signal officer.	Jan. 20, 21, 1890.
Keeler, Cal	Lieut. J. P. Finley, Signal Corps	June 25, 26, 1890.
Keokuk, Iowa	Lieut. J. C. Walshe, Signal Corps	Dec. 15, 16, 1889.
Kintyre, Mont	do	April 30, 1890.
Knoxville, Tenn	Lieut. R. B. Watkins, Signal Corps	Jan. 17, 18, 1890.
Kansas City, Mo	Lieut. F. R. Day, Signal Corps	Mar. 21, 22, 1890.
Los Angeles, Cal	Lieut. W. A. Glassford, Signal Corps	Aug. 3, 1889.
Do	Lieut. F. Greene, Signal Corps	April 3-6, 1890.
Lansing, Mich	Lieut. F. M. M. Beall, Signal Corps	Dec. 11, 12, 1889.
La Crosse, Wis	Lieut. J. C. Walshe, Signal Corps	Dec. 21, 22, 1889.

STATIONS INSPECTED, ETC.—Continued.

Stations.	By whom.	Date.
Lexington, Ky	Lieut. R. B. Watkins, Signal Corps	Jan. 21, 22, 189.
Louisville, Ky	do	Jan. 23–25, 1890.
Lynchburgh, Va	Lieut. R. E. Thompson, Sixth Infantry, signal officer.	Feb. 23, 24, 1890.
Leavenworth, Kans	Lieut. F. R. Day, Signal Corps	Mar. 20, 21, 1890.
Little Rock, Ark	Lieut. F. W. Ellis, Signal Corps	Mar. 9, 10, 1890.
Manchester, N. H	Lieut. J. P. Finley, Signal Corps	Dec. 9, 11, 1889.
McDowell, Fort, Ariz	Lieut. W. A. Glassford, Signal Corps	Aug. 13, 1889.
Milwaukee, Wis	Lieut. F. M. M. Beall, Signal Corps	Nov. 28, 29, 1889.
Do	do	June 25–27, 1890.
Marquette, Mich	do	Dec. 2, 3, 1889.
Manistee, Mich	do	Dec. 7, 8, 1889.
Moorhead, Minn	Lieut. J. C. Walshe, Signal Corps	Dec. 6, 7, 1889.
Maginnis Fort, Mont	do	May 9, 10, 1890.
Mobile, Ala	Lieut. R. E. Thompson, Sixth Infantry, signal officer.	Jan. 29, 30, 1890.
Meridian, Miss	do	Feb. 10, 1890.
Montgomery, Ala	do	Feb. 12, 13, 1890.
Montrose, Colo	Lieut. F. R. Day, Signal Corps	Mar. 9, 1890.
Memphis, Tenn	Lieut. F. W. Ellis, Signal Corps	Mar. 6, 7, 1890.
Do	Lieut. F. R. Day, Signal Corps	June 30, 1890.
Northfield, Vt	Lieut. J. P. Finley, Signal Corps	Dec. 18, 19, 1889.
Nashville, Tenn	Lieut. R. B. Watkins, Signal Corps	Jan. 9, 11, 1890.
New York City	Lieut. J. P. Finley, Signal Corps	Jan. 9–13, 1890.
New Brunswick, N. J	do	Jan. 13, 14, 1890.
New Haven, Conn	do	Jan. 15–17, 1890.
New London, Conn	do	Jan. 17–19, 1890.
Narragansett Pier, R. I	do	Jan. 23–25, 1890.
Nantucket, Mass	do	Jan. 27–29, 1890.
Norfolk, Va	Lieut. R. E. Thompson, Sixth Infantry, signal officer.	Jan. 9, 10, 1890.
New Orleans, La	do	Jan. 31, Feb. 1, 1890.
North Platte, Nebr	Lieut. F. R. Day, Signal Corps	Mar. 14, 1890.
Oswego, N. Y	Lieut. J. P. Finley, Signal Corps	Dec. 23–25, 1889.
Omaha, Nebr	Lieut. F. R. Day, Signal Corps	Mar. 18, 19, 1890.
Do	Chief Signal Officer	May 22, 1890.
Portland, Me	Lieut. J. P. Finley, Signal Corps	Dec. 11–17, 1889.
Philadelphia, Pa	do	Jan. 4–6, 1890.
Do	Lieut. F. Greene, Signal Corps	Sept. 24, 25, 1889.
Phœnix, Ariz	Lieut. W. A. Glassford, Signal Corps	Aug. 12, 1889.
Port Huron, Mich	Lieut. F. M. M. Beall, Signal Corps	Dec. 13, 14, 1889.
Parkersburgh, W. Va	Lieut. R. B. Watkins, Signal Corps	Dec. 5, 6, 1889.
Pittsburgh, Pa	do	Dec. 9–12, 1889.
Pensacola, Fla	Lieut. R. E. Thompson, Sixth Infantry, signal officer.	Jan. 27, 28, 1890.
Pueblo, Colo	Lieut. F. R. Day, Signal Corps	Mar. 8, 1890.
Palestine, Tex	Lieut. F. W. Ellis, Signal Corps	Feb. 27, 28, 1890.
Rochester, N. Y	Lieut. J. P. Finley, Signal Corps	Dec. 25–27, 1889.
Rawlins, Wyo	Lieut. J. C. Walshe, Signal Corps	May 27, 28, 1890.
Rapid City, S. Dak	do	May 30, 31, 1890.
Raleigh, N. C	Lieut. R. E. Thompson, Sixth Infantry, signal officer.	Feb. 21, 22, 1890.
Reno, Fort, Ind. T	Lieut. F. W. Ellis, Signal Corps	Mar. 19, 1890.
Rio Grande City, Tex	do	April 25, 26, 1890.
San Diego, Cal	Lieut. W. A. Glassford, Signal Corps	Aug. 5, 6, 1889.
Do	Lieut. F. Greene, Signal Corps	Mar. 28–30, 1890.
Sault de Ste. Marie, Mich	Lieut. F. M. M. Beall, Signal Corps	Dec. 4, 1889.
St. Paul, Minn	Lieut. J. C. Walshe, Signal Corps	Nov. 27–29, 1889.
St. Vincent, Minn	do	Dec. 4, 5, 1889.

STATIONS INSPECTED, ETC.—Continued.

Stations.	By whom.	Date.
San Francisco, Cal	Lieut. J. P. Finley, Signal Corps	June 29, 30, July 2 to 7, 1890.
Sioux City, Iowa	Lieut. J. C. Walshe, Signal Corps	Dec. 11, 12, 1889.
Sully, Fort, S. Dak	do	June 3, 4, 1890.
Sandusky, Ohio	Lieut. R. B. Watkins, Signal Corps	Dec. 23, 24, 1889.
Springfield, Ill	do	Jan. 2, 3, 1890.
Southport, N. C	Lieut. R. E. Thompson, Sixth Infantry, signal officer.	Jan. 13, 1890.
Savannah, Ga	do	Jan. 17, 18, 1890.
Springfield, Mo	Lieut. F. R. Day, Signal Corps	Mar. 4, 1890.
St. Louis, Mo	do	Mar. 24, 25, 1890.
Shreveport, La	Lieut. F. W. Ellis, Signal Corps	Mar. 1-3, 1890.
Supply, Fort, Ind. T	do	Mar. 20-21, 1890.
Sill, Fort, Ind. T	do	Mar. 26, 1890.
San Antonio, Tex	do	Apr. 22, 23, 1890.
Salt Lake City, Utah	Chief Signal Officer	May 18, 1890.
Toledo, Ohio	Lieut. F. M. M. Beall, Signal Corps	Dec. 17, 18, 1890.
Titusville, Fla	Lieut. R. E. Thompson, Sixth Infantry, signal officer.	Jan. 21, 22, 1890.
Topeka, Kans	Lieut. F. R. Day, Signal Corps	Mar. 20, 1890.
University, Miss	Lieut. F. W. Ellis, Signal Corps	Mar. 6, 1890.
Vineyard Haven, Mass	Lieut. J. P. Finley, Signal Corps	Jan. 30, 31, 1890.
Verde, Fort, Ariz	Lieut. W. A. Glassford, Signal Corps	July 22, 1889.
Vicksburg, Miss	Lieut. R. E. Thompson, Sixth Infantry, signal officer.	Feb. 3, 4, 1890.
Do	Lieut. F. W. Ellis, Signal Corps	Mar. 3-5, 1890.
Wood's Holl, Mass	Lieut. J. P. Finley, Signal Corps	Jan. 26, 27, 1890.
Washakie, Fort, Wyo	Lieut. J. C. Walshe, Signal Corps	May 23, 24, 1890.
Wilmington, N. C	Lieut. R. E. Thompson, Sixth Infantry, signal officer.	Jan. 12-14, 1890.
Wichita, Kans	Lieut. F. R. Day, Signal Corps	Mar. 5, 6, 1890.
Yuma, Ariz	Lieut. W. A. Glassford, Signal Corps	Aug. 8, 9, 1889.
Do	Lieut. F. Greene, Signal Corps	Mar. 23, 24, 1890.
Yankton, S. Dak	Lieut. J. C. Walshe, Signal Corps	Dec. 10, 11, 1889.
Yates, Fort, N. Dak	do	June 11, 12, 1890.

List of places for which stations have been requested during fiscal year, but not established to June 30, 1890.

Alabama:
- Decatur, July 28, 1889.

Colorado:
- Lamar, April 15, 1890.

Florida:
- Tarpon Springs, September 10, 1889.

Georgia:
- Macon, December 11, 1889.
- Rome, April 7, 1890.

Illinois:
- Peoria, January 11, 1890.

Iowa:
- Council Bluffs, February 17, 1890.

Michigan:
- Escanaba, February 20, 1890.
- Oscoda, March 29, 1890.

Minnesota:
- Crookstown, February 21, 1890.
- Minneapolis, December 7, 1889.

Minnesota—Continued.
- Red Wing, February 15, 1890.

Montana:
- Great Falls, December 23, 1889.

Nebraska:
- Lyons, June 28, 1889.

Oregon:
- Ashland, December 12, 1889.

Pennsylvania:
- Reading, August 30, 1889.
- Scranton, January 30, 1890.

Texas:
- Dallas, November 13, 1889.
- Waco, January 14, 1890.

Washington:
- Tacoma, May 15, 1890.

Wyoming:
- Rawlins, May 27, 1890.

LIST OF BOARDS OF TRADE, CHAMBERS OF COMMERCE, AND OTHER ORGANIZATIONS WHICH HAD DURING THE FISCAL YEAR ENDING JUNE 30, 1890, METEOROLOGICAL COMMITTEES CONFERRING WITH THE CHIEF SIGNAL OFFICER OF THE ARMY.

Place.	Name of organization.	Committee.
Buffalo, N. Y	Merchants' Exchange	Nathan C. Simons, Frank W. Fiske, Chas. H. Arthur.
Cairo, Ill	Board of Trade	W. P. Halliday, H. H. Candee, Jno. A. Miller.
Charleston, S. C	Merchants' Exchange	Geo. W. Bell, T. Follett Ware, John Dougherty, Philip Dressel, Geo. Von Kolnitz.
Chicago, Ill	Board of Trade	J. A. Edwards, R. G. Chandler, J. B. Dutch.
Concordia, Kans		B. H. McEkron, Theo. Laing, Prof. T. A. Sawhill.
Erie, Pa	Board of Trade	J. J. Wadsworth, H. S. Jones, Geo. Platt.
Lynchburgh, Va	Tobacco Association	General J. H. Smith, Green H. Nowlin, J. C. Woodson.
Montgomery, Ala	Commercial and Industrial Association.	D. F. Lowe, W. M. Marks, W. J. Orum, F. H. Morritt, L. B. Farley.
Nashville, Tenn	Chamber of Commerce	Col. D. W. Baird, O. H. Hight, Jno. W. Morton.
New Haven, Conn	City of New Haven	H. G. Lewis, Johnson T. Platt.
Northfield, Vt	Board of Trustees, Norwich University.	Dr. Geo. Nichols, Hiram Atkins, Dr. Wm. B. Mayo.
San Diego, Cal	Society of Natural History	Dr. G. W. Barnes, Dr. H. W. Gould, C. J. Fox.
Savannah, Ga	Savannah Cotton Exchange	C. M. Holst, A. L. Hartridge, J. J. Wilder.
St. Louis, Mo	Merchants' Exchange	J. B. Gandofo, W. T. Haarstick, W. H. Walze, Louis Helm, John M. Gannett, H. B. Jenkins, W. P. Hazard.
Tampa, Fla	City	Judge C. E. Harrison, W. B. Henderson, J. E. Sparkman.

APPENDIX 4.

REPORT OF THE OFFICER IN CHARGE OF THE VERIFICATION OF OFFICIAL FORECASTS.

SEPTEMBER 25, 1890.

SIR: I have the honor to submit the accompanying report and tables showing the percentages of verifications of official forecasts made during the fiscal year ending June 30, 1890.

The various rules and principles that have been developed and perfected for determining the percentages of verifications of the various elements constituting the daily forecasts have already been discussed in the annual reports for the two preceding years, during which years various important changes and improvements were made in the rules and principles of verications. During the past year practically no changes of importance have been made, experience having shown that the various rules, while necessarily arbitrary in many respects, are very satisfactory and as equally just under all circumstances as possible.

The usual forecasts, as heretofore, have been made from month to month by different officials, except that only one official has had charge of the study and forecast of cold waves.

The regular daily forecasts have been for twenty-four hours in advance, but in order that the public may have the advantage of longer time predictions during comparatively settled and definite weather conditions, the officials, when possible, have prepared forecasts for forty-eight and seventy-two hours in advance. The verification of these has been determined separately, but the principles applied to the regular predictions, where the percentages of verifications of the forecasts for different lengths of time have been grouped together or compared, a weight of two has been given to the forty-eight-hour forecasts and a weight of three to those for seventy-two hours as compared with the twenty-four-hour forecasts.

The percentages attained in these longer time predictions have compared very favorably with those for the regular twenty-four hour forecasts, and are presented in detail in Table II.

TABLE I.—PERCENTAGES OF VERIFICATIONS OF FORECASTS FOR THE YEAR ENDING JUNE 30, 1890.

States.	1889. July.	Aug.	Sept.	Oct.	Nov.	Dec.
Maine	75.9	83.0	80.5	85.5	84.4	79.2
New Hampshire	72.8	83.7	83.9	82.9	77.1	83.6
Vermont	73.0	81.8	84.5	80.1	76.5	81.7
Massachusetts	77.7	84.5	87.1	84.8	79.1	82.9
Rhode Island	79.9	86.6	85.8	87.0	70.9	85.3
Connecticut	77.0	80.3	83.7	85.2	72.5	84.3
Eastern New York	76.7	84.3	82.1	80.3	82.9	85.2
Western New York	82.6	84.2	82.7	86.6	80.8	77.7
Eastern Pennsylvania	76.5	85.9	82.7	82.3	80.6	84.1
Western Pennsylvania	84.1	84.8	80.4	85.7	80.2	80.5
New Jersey	75.3	82.6	77.5	88.5	80.0	88.2
Delaware	69.9	87.1	74.8	90.0	78.5	87.7
Maryland	68.1	89.5	76.0	86.3	78.9	86.5
District of Columbia	71.2	84.8	76.3	86.5	75.9	85.0
Virginia	71.5	88.8	80.5	85.9	84.3	84.5
North Carolina	80.2	85.4	82.1	89.9	84.3	87.4
South Carolina	80.5	88.7	84.9	92.5	86.2	86.8

TABLE I.—PERCENTAGES OF VERIFICATIONS, ETC.—Continued.

States.	1889. July.	Aug.	Sept.	Oct.	Nov.	Dec.
Georgia	79.3	85.4	85.3	89.3	86.9	88.7
Eastern Florida	84.1	91.4	93.9	93.1	85.0	93.6
Western Florida	78.6	82.5	89.0	91.2	86.7	95.4
Alabama	78.4	87.6	89.2	87.8	77.0	91.1
Mississippi	81.8	93.2	87.0	83.6	81.7	92.3
Louisiana	84.0	88.5	89.3	86.2	90.2	91.2
Texas	89.2	90.6	81.9	88.2	88.4	89.0
Arkansas	80.1	86.3	77.3	87.0	79.4	85.1
Tennessee	82.1	88.5	82.5	85.8	77.3	83.2
Kentucky	83.5	88.6	84.6	85.5	78.4	87.0
Ohio	82.3	85.7	80.4	80.7	83.7	84.1
West Virginia	85.0	85.0	86.3	85.4	81.9	80.9
Indiana	79.7	90.5	83.2	84.2	81.1	84.3
Illinois	81.4	89.8	84.3	84.6	80.2	83.6
Lower Michigan	74.0	88.6	81.7	85.2	85.4	82.9
Upper Michigan	81.7	78.8	70.6	82.1	81.8	77.4
Wisconsin	79.8	85.0	78.7	86.2	82.1	83.5
Minnesota	80.6	87.7	82.4	85.6	82.0	80.1
Iowa	78.9	86.3	79.5	85.6	86.3	83.4
Kansas	83.4	81.0	85.0	79.7	83.9	82.3
Nebraska	80.2	85.2	83.1	83.6	80.6	78.3
Missouri	84.4	88.0	78.7	82.4	80.2	83.5
Colorado	84.7	86.6	83.3	81.6	77.5	79.7
Dakota	85.2	89.9	82.3	82.3	------	------
North Dakota	------	------	------	------	79.4	83.7
South Dakota	------	------	------	------	79.7	80.8
Weather	83.8	88.3	85.5	89.5	85.4	85.8
Temperature	72.8	83.2	78.1	79.4	74.9	83.0
Weather and temperature combined	79.4	86.3	82.5	85.5	81.2	84.7
Pacific Coast.						
Southern California	93.7	86.9	86.1	80.3	94.5	85.9
Northern California	90.0	89.2	88.9	87.8	83.7	90.6
Oregon	87.7	88.8	88.9	83.6	84.9	81.8
Washington	87.8	86.7	84.5	78.6	85.0	80.7
Weather	98.6	96.9	96.8	88.3	90.9	89.0
Temperature	76.6	74.4	72.6	74.0	81.2	78.5
Weather and temperature combined	89.8	87.9	87.1	82.6	87.0	84.8

States.	1890. January.	February.	March.	April.	May.	June.	Average, year ending June 30, 1890.
Maine	84.0	81.1	81.4	74.8	71.2	68.4	79.1
New Hampshire	84.1	82.0	83.5	72.7	77.2	76.1	80.0
Vermont	84.2	81.2	84.2	73.9	76.5	79.9	79.8
Massachusetts	86.1	79.6	84.8	76.4	81.9	76.3	81.8
Rhode Island	83.7	84.9	82.4	75.5	78.1	77.8	81.5
Connecticut	80.4	83.6	84.1	73.1	77.7	74.5	79.7
Eastern New York	83.0	87.6	83.4	81.1	74.5	77.8	81.6

TABLE I.—PERCENTAGES OF VERIFICATIONS, ETC.—Continued.

States.	1890.						Average, year ending June 30, 1890.
	January.	February.	March.	April.	May.	June.	
Western New York	82.4	87.4	75.2	78.9	88.2	71.6	81.5
Eastern Pennsylvania	86.3	86.2	81.5	78.0	77.5	82.8	82.0
Western Pennsylvania	83.7	81.4	73.9	77.5	86.7	80.3	81.6
New Jersey	81.9	85.4	84.4	76.7	77.2	78.3	81.3
Delaware	82.5	85.5	91.5	76.5	83.5	80.6	82.3
Maryland	84.4	84.7	90.6	77.1	83.0	85.4	82.5
District of Columbia	85.7	82.7	89.0	78.2	85.2	84.5	82.1
Virginia	87.4	84.0	86.0	79.7	81.5	84.5	83.5
North Carolina	88.5	82.1	85.9	80.3	82.0	84.4	84.4
South Carolina	87.2	86.6	82.2	80.2	83.9	84.3	85.3
Georgia	89.1	87.0	83.7	77.7	84.0	85.1	85.1
Eastern Florida	95.2	89.4	78.1	85.0	87.9	85.3	88.5
Western Florida	94.3	89.6	86.3	93.9	85.7	87.9	88.4
Alabama	89.5	84.5	84.8	82.9	80.2	89.3	85.2
Mississippi	86.8	87.3	81.9	79.9	78.3	88.6	85.2
Louisiana	87.0	87.3	80.8	77.3	80.3	87.6	85.8
Texas	90.2	86.3	81.1	78.9	86.1	92.6	86.9
Arkansas	87.5	83.3	82.3	78.9	78.8	85.7	82.6
Tennessee	84.1	89.5	86.2	79.5	82.8	82.5	83.7
Kentucky	84.1	85.6	83.9	82.1	79.8	86.1	84.1
Ohio	84.5	82.9	74.5	74.9	85.7	82.6	81.8
West Virginia	84.9	81.1	79.7	76.9	81.9	83.9	82.7
Indiana	87.7	79.5	77.4	80.5	87.0	80.9	83.0
Illinois	85.3	86.9	82.8	83.0	86.9	84.8	84.5
Lower Michigan	85.3	86.9	82.1	80.0	77.7	79.5	82.4
Upper Michigan	82.1	79.6	79.5	78.6	75.9	76.3	78.7
Wisconsin	84.7	80.6	82.1	78.5	75.7	75.9	81.1
Minnesota	82.9	82.2	79.4	80.1	71.0	72.3	80.5
Iowa	84.1	85.1	78.6	80.7	81.4	73.3	81.9
Kansas	87.4	81.1	75.2	71.2	79.4	79.1	80.7
Nebraska	83.4	80.6	80.5	76.6	81.2	74.7	80.7
Missouri	85.0	79.6	82.6	70.9	86.3	88.1	82.5
Colorado	82.8	79.3	71.7	81.2	76.3	86.3	80.9
Dakota	-----	-----	-----	-----	-----	-----	84.9
North Dakota	78.7	83.4	77.4	85.9	68.8	72.7	78.8
South Dakota	81.7	82.2	81.4	85.3	78.6	79.5	81.1
Weather	85.8	85.2	82.1	83.5	82.6	84.6	85.2
Temperature	84.5	82.2	81.5	71.7	77.7	75.9	78.7
Weather and temperature combined	85.3	84.0	81.9	78.8	80.6	81.1	82.6
Pacific Coast.							
Southern California	88.3	89.7	82.1	87.7	85.3	92.6	87.8
Northern California	86.9	88.9	82.8	85.1	78.9	88.9	86.8
Oregon	90.8	77.1	75.9	81.7	82.6	77.8	83.5
Washington	87.8	84.2	78.4	75.9	80.9	79.5	82.5
Weather	90.1	89.4	87.6	91.7	89.1	92.4	91.7
Temperature	86.0	79.2	68.1	69.1	71.1	73.1	75.3
Weather and temperature combined	88.5	85.3	79.8	82.7	81.9	84.7	85.2

TABLE II.—VERIFICATIONS OF FORTY-EIGHT AND SEVENTY-TWO HOUR FORECASTS FOR THE YEAR ENDING JUNE 30, 1890.

Month.	Forty-eight hours.					Seventy-two hours.				
	No. of forecasts.		Per cent. of verifications.			No. of forecasts.		Per cent. of verifications.		
	Weather.	Temperature.	Weather.	Temperature.	Weather and temperature combined.	Weather.	Temperature.	Weather.	Temperature.	Weather and temperature combined.
1889.										
July	19	41	67.1	71.5	68.9	......	......	......	......	......
August	24	36	71.7	94.4	80.6	......	8	......	100.0	100.0
September	38	44	73.2	83.9	78.4	13	7	97.7	35.9	81.3
October	245	45	88.8	94.7	91.2	7	1	100.0	100.0	100.0
November	106	62	84.1	88.4	85.8	......	......	......	......	......
December	158	92	74.5	84.9	78.7	34	7	79.4	78.6	79.0
1890.										
January	2	51	100.0	85.7	86.5	......	......	......	......	......
February	50	44	63.2	84.3	71.0	7	7	100.0	14.3	65.7
March	195	132	78.5	94.2	83.3	7	34	82.9	86.5	85.6
April	86	42	86.9	77.4	78.8	......	......	......	......	......
May	125	51	77.8	70.2	75.9	......	......	......	......	......
June	43	102	88.8	72.2	78.6	6	8	91.7	61.2	77.4
Total	1,091	742	80.6	83.9	81.6	74	72	87.9	72.7	80.5

TABLE III.—STATEMENT SHOWING PERCENTAGES OF JUSTIFICATIONS OF WIND SIGNALS FOR THE YEAR ENDING JUNE 30, 1890.

Month.	Total number ordered.	Justified as to velocity.		Justified as to direction.	Cautionary.			Storm.		
						Justified as to velocity.			Justified as to velocity.	
		Wholly.	Partly.		Ordered.	Wholly.	Partly.	Ordered.	Wholly.	Partly.
1889.										
July	23	13	......	22	23	13	......	......	......	......
August	46	30	......	45	45	29	......	1	1	......
September	155	95	10	151	114	73	2	41	22	8
October	119	81	5	110	96	65	1	23	16	4
November	122	82	4	120	99	63	1	23	19	3
December	71	50	5	62	49	35	1	22	15	4
1890.										
January	90	76	4	83	62	52	2	28	24	2
February	110	76	7	107	63	40	3	47	36	4
March	110	77	8	102	72	50	4	38	27	4
April	69	43	2	66	55	34	1	14	9	1
May	154	80	13	129	126	66	5	28	14	8
June	43	22	1	43	39	19	......	4	3	1
Total	1,112	695	59	1,040	843	539	20	269	186	39

TABLE III.—STATEMENT SHOWING PERCENTAGES OF JUSTIFICATIONS OF WIND SIGNALS, ETC.—Continued.

Month.	For easterly winds.		For westerly winds.		Number of winds without signals.	Number of signals ordered late.	Percentage of justifications.
	Ordered.	Justified.	Ordered.	Justified.			
1889.							
July	11	10	12	12	21	4	46.6
August	18	17	28	28	12	5	66.8
September	71	67	84	84	21	6	71.6
October	65	56	54	54	14	26	69.7
November	56	54	66	66	26	16	70.1
December	30	22	41	40	20	4	68.6
1890.							
January	16	12	74	71	24	16	74.7
February	28	27	82	80	14	10	75.5
March	49	44	61	58	24	10	71.6
April	34	33	35	33	14	5	68.0
May	40	32	114	97	32	8	60.0
June	27	27	16	16	16	1	59.8
Total	445	401	667	639	238	111	*67.1

* Yearly per cent.

TABLE IV.—PERCENTAGES OF JUSTIFICATIONS OF COLD WAVE SIGNALS FOR THE YEAR ENDING JUNE 30, 1890.

Month.	Ordered.	Justified.	Per cent. of justifications.
1889.			
July	0		
August	0		
September	2	0	
October	0		
November	161	51	31.7
December	219	122	55.7
1890.			
January	395	264	66.8
February	412	228	55.3
March	74	29	39.2
April	33	13	39.4
May	0		
June	0		
Total	1,296	707	54.6

NOTE.—During the year only 18 cold waves occurred without signals, and no signals were orderd late, that is, after a fall in temperature sufficient to justify a signal had occurred.

TABLE V.—PERCENTAGES OF FORECAST OFFICIALS FOR THE YEAR ENDING JUNE 30, 1890.

Officials.	Months.	Weather.	Temperature.	Monthly average.	Wind signals.	Average of all forecasts.
Captain Allen	September, 1889	85.5	78.1	82.5	71.6	79.4
	December, 1889	85.8	83.0	84.7	68.6	80.2
	March, 1890	82.1	81.5	81.9	71.6	79.0
	Annual average	84.5	80.9	83.0	70.9	79.5
Captain Dunwoody	August, 1889	88.3	83.2	86.3	66.8	80.7
	January, 1890	85.3	84.5	85.3	74.7	82.3
	Annual average	87.0	83.9	85.8	72.0	81.9
Lieutenant Thompson	July, 1889	83.8	72.8	79.4	46.6	70.0
	November, 1889	85.4	74.9	81.2	70.1	78.0
	April, 1890	83.5	71.7	78.8	68.0	75.7
	Annual average	84.2	73.1	79.8	66.2	75.9
Lieutenant Glassford	February, 1890	85.2	82.2	84.0	75.5	81.6
	May, 1890	82.6	77.7	80.6	60.0	74.7
	Annual average	83.9	80.0	82.3	66.3	77.7
Professor Hazen	October, 1889	89.5	79.4	85.5	69.7	81.0
	June, 1890	84.6	75.9	81.1	59.8	75.0
	Annual average	87.0	77.0	83.3	66.8	78.6
Lieutenant Maxfield	July, 1889	98.6	76.6	89.8		
	August, 1889	96.9	74.4	87.9		
	September, 1889	96.8	72.6	87.1		
	October, 1889	88.3	74.0	82.6		
	November, 1889	90.9	81.2	87.0		
	December, 1889	89.0	78.5	84.8		
	January, 1890	90.1	86.0	88.5		
	February, 1890	89.4	79.2	85.3		
	March, 1890	87.6	68.1	79.8		
	April, 1890	91.7	69.1	82.7		
	May, 1890	89.1	71.1	81.9		
	June, 1890	92.4	73.1	84.7		
	Annual average	91.7	75.3	85.2		

Respectfully submitted.

C. F. MARVIN,
Assistant Professor in Charge of Verifications.

The CHIEF SIGNAL OFFICER.

APPENDIX 5.

REPORT ON FORECASTS OF COLD WAVES.

SIGNAL OFFICE,
Washington City, July 15, 1890.

SIR: I have the honor to make the following report on the forecasts of cold waves for the year past:

A change in the Signal Service definition of a cold wave was made in November, 1889. According to the new rule no cold-wave signal can be verified for the States of Montana, North and South Dakota, and Minnesota unless there is a 20° fall of temperature in twenty-four hours, going as low as 32°. For the States of Wyoming, Colorado, Nebraska, Kansas, Iowa, Missouri, Wisconsin, Illinois, Michigan, Indiana, Kentucky, Ohio, West Virginia, western Pennsylvania, New York (except New York City and Long Island), Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, and Maine there is required for verifying a cold-wave signal a fall of at least 18° in twenty-four hours, with the temperature going to at least 34°. For New York City and Long Island, eastern Pennsylvania, New Jersey, Delaware, District of Columbia, Maryland, Virginia, North Carolina, South Carolina, Tennessee, Georgia, northern Alabama, northern Mississippi, northern Louisiana, Indian Territory, and Texas (except a strip of 100 miles along the Gulf coast) a fall of at least 16,° going to a temperature of 36°, is required to verify a cold-wave signal.

A frost-warning flag, the same as the cold-wave flag, white with a black square in the center, is displayed at stations in Florida and at places within 100 miles of the Gulf coast when it is anticipated that the temperature will fall to 32° or freezing point, regardless of the extent of temperature-fall by which it may be preceded.

This rule is a wide departure from that of preceding years, when a 15° fall, going to 45°, was sufficient to verify the display of a cold-wave signal at any station.

In the following table is given the number of cold-wave signals displayed at places throughout the United States during the various months, also the number of signals verified for each place and the number of severe cold waves which occurred when no signals were displayed.

A severe cold wave is a fall of temperature in the districts above enumerated 6° greater than the least fall for which a signal can be verified and going at least 6° lower than the highest temperature for which a verification is given and the area of fall exceeds 50,000 square miles in extent.

COLD-WAVE SIGNALS.

Localities.	Nov., 1889.		Dec., 1889.		Jan., 1890.		Feb., 1890.		Mar., 1890.		Apr., 1890.		Total.		
	Displayed.	Verified.	Displayed.	Verified.	Displayed.	Verified.	Displayed.	Verified.	Displayed.	Verified.	Displayed.	Verified.	Displayed.	Verified.	Severe cold waves without signals.
Portland, Me	1	---	3	2	4	2	6	5	2	1	---	---	16	10	----
Boston, Mass	1	---	3	2	5	4	6	4	2	---	---	---	17	10	----
Manchester, N. H	1	---	3	2	5	4	6	4	2	---	---	---	17	10	----
New London, Conn	1	---	3	2	5	4	6	3	1	---	---	---	16	9	----
New Haven, Conn	1	1	2	2	5	4	6	3	1	---	---	---	15	10	----
Albany, N. Y	1	---	3	2	5	3	7	3	2	---	---	---	18	8	----
New York City	1	---	3	2	5	3	7	4	1	---	---	---	17	9	----
Harrisburg, Pa	---	---	2	2	5	4	5	2	1	---	---	---	18	8	----

COLD-WAVE SIGNALS—Continued.

Localities.	Nov., 1889.		Dec., 1889.		Jan., 1890.		Feb., 1890.		Mar., 1890.		Apr., 1890.		Total.		
	Displayed.	Verified.	Displayed.	Verified.	Displayed.	Verified.	Displayed.	Verified.	Displayed.	Verified.	Displayed.	Verified.	Displayed.	Verified.	Severe cold waves without signals.
Philadelphia, Pa	1	---	1	1	5	3	4	3	1	---	---	---	12	7	----
Baltimore, Md	1	---	1	1	5	3	5	3	1	---	---	---	13	7	----
Washington City	1	---	1	1	5	3	5	2	1	---	---	---	13	6	----
Lynchburgh, Va	2	1	1	1	6	3	5	3	1	---	---	---	15	8	----
Norfolk, Va	1	1	1	1	6	2	6	4	1	1	---	---	15	9	----
Charlotte, N. C	2	---	1	1	6	3	5	3	1	1	---	---	15	8	----
Raleigh, N. C	2	---	1	1	6	2	5	3	1	---	---	---	15	6	----
Wilmington, N. C	---	---	1	---	4	2	2	1	---	---	---	---	7	3	----
Charleston, S. C		---	1	---	4	1	3	1	1	1	---	---	9	3	----
Columbia, S. C	1	---	1	---	4	2	3	2	1	1	---	---	10	5	----
Augusta, Ga	1	1	1	---	6	2	2	---	---	---	---	---	10	3	----
Savannah, Ga	---	---	1	---	3	1	2	1	1	1	---	---	7	3	----
Atlanta, Ga	1	---	1	---	6	2	4	3	---	---	---	---	12	5	----
Montgomery, Ala	---	---	1	---	7	2	2	1	---	---	---	---	10	3	----
Vicksburg, Miss	1	---	1	---	6	3	3	1	---	---	---	---	11	4	----
Oxford, Miss	2	---	3	1	6	3	7	2	---	---	---	---	18	6	----
Meridian, Miss	1	---	1	---	6	2	3	2	---	---	---	---	11	4	----
Shreveport, La	1	1	1	---	5	3	3	---	---	---	---	---	10	4	----
Fort Smith, Ark	3	---	3	1	7	4	5	3	---	---	---	---	18	8	----
Little Rock, Ark	3	---	3	1	7	3	5	2	---	---	---	---	18	6	----
Palestine, Tex	1	1	---	---	---	---	---	---	---	---	---	---	---	---	----
Abilene, Tex	1	1	---	---	2	2	2	2	---	---	---	---	5	5	----
Memphis, Tenn	3	---	4	1	6	3	7	2	1	1	---	---	21	7	----
Nashville, Tenn	3	1	3	1	6	3	6	1	1	1	---	---	19	7	----
Chattanooga, Tenn	2	1	1	---	5	1	5	2	1	---	---	---	14	4	----
Knoxville, Tenn	2	1	1	---	5	2	5	2	1	1	---	---	14	6	----
Louisville, Ky	4	---	4	2	8	4	8	3	1	1	---	---	25	10	----
Indianapolis, Ind	4	---	3	1	6	3	6	4	1	1	1	1	21	10	----
Cincinnati, Ohio	3	1	4	2	7	4	8	3	1	---	1	---	23	10	----
Lexington, Ky	4	1	4	2	8	4	7	2	1	1	---	---	24	10	----
Columbus, Ohio	3	2	4	2	7	5	7	5	2	---	1	1	24	15	---
Parkersburgh, W. Va	3	1	3	2	7	4	7	3	2	2	1	---	23	12	----
Pittsburgh, Pa	3	2	4	2	7	5	7	4	2	1	1	---	24	14	----
Oswego, N. Y	1	---	4	3	5	5	6	3	2	---	1	1	19	12	----
Rochester, N. Y	1	---	3	2	5	5	6	3	1	---	1	1	17	11	----
Ithaca, N. Y	1	---	3	2	5	4	6	2	1	---	1	---	17	8	----
Buffalo, N. Y	1	1	2	2	5	5	6	2	1	---	1	1	16	11	----
Erie, Pa	2	---	5	2	5	4	6	1	2	---	1	1	21	8	----
Cleveland, Ohio	3	1	5	2	6	5	7	2	2	1	1	1	24	12	----
Sandusky, Ohio	3	2	4	3	6	4	7	3	2	---	1	1	23	13	----
Toledo, Ohio	3	---	2	1	5	4	7	2	1	---	1	1	19	8	----
Detroit, Mich	2	---	2	1	5	4	7	2	1	---	---	---	17	7	---
Port Huron, Mich	2	---	2	1	5	4	6	1	1	---	---	---	16	6	----
Lansing, Mich	1	---	2	1	5	4	7	2	1	1	---	---	16	8	----
Alpena, Mich	1	---	2	1	2	2	6	4	1	---	---	---	12	7	----
Sault de Ste. Marie, Mich	---	---	2	1	2	2	5	2	1	---	---	---	10	5	----
Marquette, Mich	2	1	2	1	1	1	6	3	---	---	---	---	11	6	----
Green Bay, Wis	3	---	3	2	3	2	7	3	---	---	---	---	17	7	----
Grand Haven, Mich	1	---	1	1	3	3	5	3	1	---	---	---	11	7	----
Milwaukee, Wis	1	---	3	2	5	4	7	4	---	---	---	---	16	10	----
Chicago, Ill	3	---	3	2	7	5	7	4	1	---	---	---	21	11	----

COLD-WAVE SIGNALS—Continued.

Localities.	Nov., 1889.		Dec., 1889.		Jan., 1890.		Feb., 1890.		Mar., 1890.		Apr., 1890.		Total.		
	Displayed.	Verified.	Displayed.	Verified.	Displayed.	Verified.	Displayed.	Verified.	Displayed.	Verified.	Displayed.	Verified.	Displayed.	Verified.	Severe cold waves without signals.
Duluth, Minn	2	2	3	2	3	2	6	5	1	---	---	---	15	11	---
St. Paul, Minn	2	---	3	2	3	3	5	4	1	---	1	1	15	10	---
La Crosse, Wis	2	---	3	2	4	3	6	3	---	---	1	---	17	8	2
Dubuque, Iowa	2	---	3	3	5	4	7	4	1	1	1	---	19	12	1
Davenport, Iowa	2	1	3	3	5	3	6	3	1	1	1	---	18	11	1
Des Moines, Iowa	2	1	4	3	4	3	6	5	1	1	1	---	18	13	---
Keokuk, Iowa	2	1	4	4	5	3	6	4	1	1	1	---	19	13	1
Springfield, Ill	2	1	4	2	7	5	7	5	1	1	---	---	21	14	1
Cairo, Ill	2	---	4	1	7	4	6	2	1	1	---	---	20	8	---
St. Louis, Mo	2	1	4	1	7	6	6	3	1	1	---	---	20	12	---
Columbia, Mo	2	---	1	1	4	3	5	4	---	---	1	---	12	8	---
Springfield, Mo	2	1	4	2	4	3	4	3	---	---	---	---	14	9	---
Kansas City, Mo	2	---	4	1	4	4	6	4	1	1	1	---	18	10	---
Wichita, Kans	2	2	4	3	4	4	5	4	---	---	---	---	15	13	---
Concordia, Kans	2	---	4	3	2	2	5	4	1	---	1	---	15	9	---
Omaha, Nebr	2	2	5	5	3	2	5	5	1	1	1	---	17	15	---
Sioux City, Iowa	2	2	3	3	3	3	6	6	2	---	1	---	17	14	---
Valentine, Nebr	2	2	2	---	2	1	3	2	---	---	1	1	10	6	---
Yankton, S. Dak	---	---	3	2	2	2	6	5	1	---	1	---	13	9	---
Crete, Nebr	2	---	2	---	3	2	3	3	1	1	1	---	12	6	---
Leavenworth, Kans	2	---	3	3	4	4	6	4	1	1	1	---	17	12	---
Topeka, Kans	1	---	3	3	4	4	6	4	1	1	1	---	16	12	---
Huron, S. Dak	2	2	3	2	3	2	4	3	1	---	1	1	14	10	---
Moorhead, Minn	1	1	3	3	3	3	2	2	---	---	---	---	9	9	2
St. Vincent, Minn	---	---	2	2	2	1	---	---	---	---	---	---	4	3	2
Bismarck, N. Dak	2	1	2	1	1	---	2	2	---	---	---	---	7	4	3
Fort Buford, N. Dak	1	1	2	2	1	---	1	1	---	---	---	---	5	4	1
Rapid City, S. Dak	2	2	2	---	2	1	3	1	---	---	---	---	9	4	---
Cheyenne, Wyo	2	1	---	---	1	1	---	---	---	---	1	1	4	3	---
North Platte, Nebr	2	1	2	---	2	2	4	3	---	---	1	---	11	6	---
Denver, Colo	1	1	---	---	1	1	1	1	---	---	1	---	4	3	---
Montrose, Colo	1	1	---	---	1	---	---	---	---	---	---	---	2	1	---
Pueblo, Colo	1	1	---	---	1	---	2	1	---	---	---	---	4	2	---
Dodge City, Kans	2	2	---	---	1	1	4	3	---	---	---	---	7	6	---

In the table following is given a condensed summary of the cold waves for the various months. There is also given the number of falls of 18° or more when there was no verification of the signal on account of the temperature not falling to the verifying limit. In addition there is given the number of 16°, 14°, and 12° falls going below the verifying limit for which no verifications were allowed.

SUMMARY OF COLD-WAVE SIGNALS, 1889 AND 1890.

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Year.
Cold-wave signals ordered	2	0	161	221	395	412	74	33	1,298
Signals verified	0	----	51	122	265	229	29	13	709
Percentage of verification	----	----	32	55	67	56	39	39	55
Severe cold waves without signals	1	0	0	0	4	9	0	0	14
Eighteen-degree or greater falls not verified	----	----	9	22	19	32	5	0	87
Sixteen-degree falls not verified	----	----	11	5	12	16	3	0	47
Fourteen-degree falls not verified	----	----	13	4	13	22	2	0	54
Twelve-degree falls not verified	----	----	18	3	9	22	11	0	63

The percentage of verification, 55, is a little less than that for last year which was 56.8. This is due solely to the change in the rules for veryifying. If verifications were allowed for the falls of over 18° which did not quite reach the limit of temperature, and also for the falls of 16° and 14°, which would have made the verification on the same basis as last year, then the percentage would have been 69 instead of 55.

As to what should properly constitute a cold wave it is very difficult to determine. Whether a very low temperature or a great fall in temperature shall be considered the essence of a cold wave is a mooted question. The Signal Service practice and definition have always been to lay stress rather on the great falls in temperature than on the low temperatures. The popular conception of a cold wave, however, is in most places associated with a low temperature, at least in the winter season. In the summer, however, references to cold waves by the newspapers relate to a fall of temperature and not so much to an abnormally low temperature for the season.

When the temperatures are low, considerable falls of temperature are not so apt to occur as when high. Many exceedingly important falls, both as regards the comfort and business interests of the community, are comparatively small falls when the temperature is already quite low. For instance, at Washington City the past season the two most important falls were those of November 27, 1889, and February 20, 1890, which were only 12°, and although flags were displayed no verifications could be given under the rules as they stand at present.

For South Carolina, Georgia, Alabama, Mississippi, and Louisiana the limit of 36° for verifying a cold wave is too low. The great falls of temperature in that section are far short in most cases of reaching so low a temperature. In some instances last season where cold waves were not verified the public nevertheless was well satisfied with the predictions. At Montgomery, Ala., for instance, there was one case of a fall of 36° when a cold-wave signal was displayed, which was not verified, as the temperature only went to about 38°. While it may not be expedient in most cases to order a cold-wave flag display unless the temperature goes to 36°, yet when the fall is great it would constitute a valuable warning to a community and ought to be signalized in some way. It is not a possible thing to predict a temperature in a prospective cold wave as near as 4°. Whenever a cold wave is anticipated and the temperature is expected to go nearly to the limiting temperature the tendency is to put up a cold-wave signal so as to make sure of doubtful cases.

I would recommend that hereafter, wherever a 24° fall of temperature in twenty-four hours is anticipated and the lowest temperature is to be about 36° to 44°, that a statement of the anticipated fall be made in the forecasts in addition to the general forecast of temperature. A forecast would then read about as follows: "Alabama, lower temperature; a fall of 36° at Montgomery." This would probably be an acceptable innovation to the public and would be a satisfaction to the forecaster of cold waves who, in the close cases where flags are not displayed, is always in fear that a cold wave within the meaning of the definition may be missed.

The whole number of places where severe cold waves occurred when no flags were displayed was only fourteen.

A plan for the forecasting cold waves in the future has been devised. The details as far as have been worked out are given in the paper accompanying this report entitled "Prediction of Cold Waves from Signal-Service Weather Maps." This plan of forecasting it is proposed to put in operation the coming season.

It is believed that forecasts made in accordance with this method will be more trustworthy than those of the past year.

Very respectfully,

T. RUSSELL,
In Charge of Cold-Wave Warnings.

General A. W. GREELY,
Chief Signal Officer, U. S. Army.

PREDICTION OF COLD WAVES FROM SIGNAL SERVICE WEATHER MAPS.

[By Thomas Russell, Assistant Professor, Signal Service.]

WASHINGTON CITY, *July* 28, 1890.

In addition to such changes of temperature as take place regularly from day to night there are also large irregular falls of temperature occurring from time to time over great areas of country. Warnings are issued from the Signal Office, Washington City, by telegraph to various places throughout the country where it is anticipated that great falls of temperature are about to occur. The basis of the warnings are the meteorological conditions observed instrumentally at 141 stations of the Signal Service scattered over the whole extent of the United States, an area of about 2,970,000 square miles, excluding Alaska, and from 24 other stations in the Dominion of Canada; 9 in the far Northwest, and 15 in the Maritime Provinces. The observations are made twice a day, at 8 a. m. and 8 p. m. Special observations are sometimes made during the day, as called for from the Washington office, whenever the data of the 8 a. m. observation does not appear decisive as to what is about to occur.

The cold-wave flag, white with a black square in center, is hoisted at Signal Service stations whenever a warning of a great fall in temperature is issued to the place. The telegram states the lowest temperature that may be expected and the time of its occurrence. The cold-wave flag is displayed at signal stations in Minnesota, North Dakota, South Dakota, and Montana when it is anticipated that there will be a fall of temperature of 20° or more in twenty-four hours, and the lowest temperature goes below 32°.

The cold-wave flag is displayed for a fall of temperature of 18° or more, falling to at least 34°, at Signal Service stations in Wyoming, Colorado, Nebraska, Kansas, Iowa, Missouri, Wisconsin, Illinois, Michigan, Indiana, Kentucky, Ohio, West Virginia, western Pennsylvania, New York State except New York City and Long Island, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, and Maine.

The cold-wave flag is displayed for a fall of 16°, going to at least 36°, at New York City and Long Island, and at stations in New Jersey, Delaware, eastern Pennsylvania, District of Columbia, Maryland, Virginia, North Carolina, South Carolina, Tennessee, Georgia, northern Alabama, northern Mississippi, northern Louisiana, Arkansas, Indian Territory, and Texas, except a strip 100 miles in width along the Gulf coast.

A frost-warning flag, the same as cold-wave flag, is displayed at stations in Florida and in other States at places within 100 miles of the Gulf coast and in the Pacific coast States when it is anticipated that frosts will occur, regardless of what the preceding fall of temperature may be. A frost or freezing temperature may occur at the ground in these places when the temperature in the Signal Service thermometer shelters, which are usually at least 40 feet above the ground, does not go any lower than 40°.

The falls and temperatures given above are the least which can justify a display of a cold-wave signal in the various districts. When a cold-wave warning is issued and these limits are not reached, the warning is considered a failure. The falls in temperature for the various districts are not, however, considered of great importance unless they are 6° greater than the least falls given above, for which a cold-wave warning can be justified, and the temperature goes at least 6° below the highest justifying temperature. These latter limits, 6° greater than those given above for the various districts, and the temperature going at least 6° lower, constitute what is called a severe cold wave, when the 20° fall of temperature covers an area of at least 50,000 square miles.

For simplicity in discussion, a cold wave will be considered here as a 20° fall of temperature in twenty-four hours, covering an area of at least 50,000 square miles when the temperature in any part of the area goes to at least 36°.

There are many falls in temperature of less than 20° a knowledge of which would be of importance. The lowest temperatures at a place rarely occur with the greatest falls. The greatest falls are apt to occur when the temperature is high for the time of the year. A temperature of 60° in January, for instance, is apt to be followed by a fall of 40°. With a temperature of 20°, however, there is rarely likely to be a fall of more than 10° or 12°. Small falls at low temperatures are noticed more by the public as affecting personal comfort or business interests than large falls when the temperatures do not go so very low.

The main thing, however, that a Signal Service cold-wave flag is meant to signalize is a prospective great fall of temperature rather than a very low temperature.

There is a great mass of meteorological material in the Signal Office at Washington City available for the investigation of cold waves. For the purpose of forecasting the weather the observations made twice a day all over the country are charted. These observations include the barometric pressure reduced to sea-level, the temperature, rainfall, wind velocity for five minutes preceding the time of an observation, and also greatest wind velocity in preceding twelve hours, the weather at the time of observation, whether raining or snowing, or whether the sky is clouded completely or only half cloudy. These two maps, which are called the weather-maps, with their isobaric and isothermal lines, generalize the observations of pressure and temperature over the whole country. They are printed and issued to the public two hours and a half after the time the observations are made at places all over the country 1,000 or 2,000 miles from the central office in Washington.

In addition to the weather-maps auxiliary charts are prepared at the Washington office for forecasting the weather. On one the rises and falls of pressure for the past twelve and twenty-four hours are shown by lines joining the points of equal rise and fall. The falls of 0.1, 0.2, 0.3 of an inch, etc., are shown and also the rises. The twelve-hour changes are in blue pencil lines, the twenty-four hour changes in red.

Another map shows the changes in temperature. The twelve-hour changes, corrected for diurnal range, are in blue; the twenty-four hour changes are in red. Another chart gives the kinds of clouds, stratus, cumulus, cirrus, etc., the lower clouds in blue, the upper in red, and the extent of sky covered, whether one-quarter, one-half, or three-quarters, or all covered. The cloud chart gives also in the morning the minimum temperatures observed by means of the self-registering alcohol thermometer, and in the evening the maximum temperature from the self-registering mercurial thermometer.

Another chart gives the temperature of the dew-point of the air, that is, the temperature to which if the air is cooled dew will begin to be deposited.

The temperature-change charts, by the twenty, thirty, forty, etc., temperature-fall lines, show where a cold wave is prevailing. They are very various in extent, sometimes covering enormous areas of country. In the greatest, that of January 17, 1882, the 20° fall line included an area of 1,101,000 square miles, while the 10° fall line included an area of 2,929,000 square miles. In another almost as large, that of February 17, 1883, the area within the 10° fall line was 1,381,000 square miles; that within the 20° fall line, 1,065,000; that within 30°, 640,000; that within 40°, 187,000; that within the 50° curve, 31,000 square miles.

In ten years there have been six cold waves in which the area within the 20° fall line exceeded 1,000,000 square miles.

In Table I is given a catalogue, in chronological order, of all the cold waves of an extent of 50,000 square miles or over that have occurred in the United States from January 1, 1880, to December 31, 1889, during the months of October, November, December, January, February, and March. The catalogue gives the areas in thousands of square miles included by the twenty, thirty, forty, etc.. temperature-fall lines. The "extent of cold-wave" is a fall of 20° over an area of 50,000 square miles or 10° over an area of 100,000 square miles. The table also gives the place of greatest fall, the greatest fall in temperature, and the temperature before the fall occurred.

TABLE I.—CATALOGUE OF COLD WAVES IN THE UNITED STATES OCTOBER, NOVEMBER, DECEMBER, JANUARY, FEBRUARY, AND MARCH, 1880 TO 1889, INCLUSIVE.

[Areas within temperature fall lines —20, —30, —40 degrees, etc., given in thousands of square miles. Last column gives extent of cold wave, taking a 20-degree fall over an area of 50,000 square miles as unity. The date given is the day of the lower temperature; the temperature is that at place of greatest fall, and the amount of greatest fall.]

Date.	—20	—30	—40	—50	—60	Center of cold wave.	Temperature.	Fall of temperature.	Extent of cold wave.
1880							°	°	
Jan. 2	131	37	11	------	------	St. Vincent, Minn	31	41	3.6
3	141	49	-----	------	------	Montreal, Quebec	38	35	3.8
4	38	-----	-----	------	------	Omaha, Nebr	53	22	1.0
6	329	153	55	double area		St. Vincent, Minn	25	44	10.3
10	355	14	-----	------	------	La Crosse, Wis	49	31	9.1
11	352	37	-----	double area		Quebec, Quebec	37	32	9.1
12	8'3	184	41	------	------	Madison, Wis	51	41	22.4
13	211	34	-----	------	------	Burlington, Vt	43	31	5.5
14	174	28	-----	------	------	Smithville, N. C	60	32	4.5
19	206	32	-----	------	------	Fort Buford, N. Dak	36	31	5.4
20	148	31	-----	------	------	Rockliffe, Ont	32	27	4.0

TABLE I.—CATALOGUE OF COLD WAVES IN THE UNITED STATES, ETC.—Continued.

Date.		—20	—30	—40	—50	—60	Center of cold wave.	Temperature.	Fall of temperature.	Extent of cold wave.
1880.								°	°	
Jan.	21	-----	-----	-----	-----	-----	Nashville, Tenn	58	21	-----
							Cheyenne, Wyo	41	25	-----
	22	186	13	-----	-----	-----	St. Vincent, Minn	20	30	4.7
	23	52	-----	-----	-----	-----	St. Paul, Minn	30	20	1.2
	26	259	55	-----	-----	-----	Virginia City, Mont	37	37	7.0
	27	142	20	-----	-----	-----	Cheyenne, Wyo	22	33	3.7
	28	136	-----	-----	-----	-----	St. Paul, Minn	23	23	3.2
	29	388	173	33	-----	-----	Quebec, Quebec	35	41	11.7
	31	409	48	-----	-----	-----	St. Louis, Mo	59	35	10.7
Feb.	1	455	-----	-----	-----	-----	Chatham, N. B	40	31	10.6
	7	70	15	-----	-----	-----	Yankton, S. Dak	33	34	1.8
	8	-----	-----	-----	-----	-----	Pittsburgh, Pa	35	23	-----
	9	259	33	-----	-----	-----	St. Paul, Minn	30	40	6.8
	10	439	255	-----	-----	-----	Chatham, N. B	22	40	13.0
	12	413	56	-----	-----	-----	Omaha, Nebr	49	24	10.8
	13	235	33	-----	-----	-----	Abilene, Tex	68	32	6.2
	14	122	15	-----	-----	-----	Knoxville, Tenn	66	31	3.2
	15	91	-----	-----	-----	-----	Chatham, N. B	5	21	2.1
	17	88	18	-----	-----	-----	Deadwood, N. Dak	35	31	2.5
	18	353	19	-----	-----	-----	La Crosse, Wis	44	36	9.0
	19	566	151	-----	-----	-----	Rochester, N. Y	52	41	15.4
	20	70	-----	-----	-----	-----	Sydney, Nova Scotia	42	35	1.6
	27	515	329	-----	-----	-----	Virginia City, Mont	22	39	15.6
	28	299	168	17	-----	-----	Fort Elliott, Tex	48	41	9.3
	29	506	85	-----	-----	-----	St. Louis, Mo	60	42	13.4
Mar.	1	43	-----	-----	-----	-----	Burlington, Vt	34	35	1.0
	3	250	84	-----	-----	-----	Fort Assinniboine, Mont	31	35	6.9
	5	41	-----	-----	-----	-----	Dodge City, Kans	60	32	1.0
	6	43	-----	-----	-----	-----	Rockliffe, Ont	22	27	1.0
	7	353	40	-----	-----	-----	Bismarck, N. Dak	22	38	9.1
	8	130	16	-----	-----	-----	Saugeen, Ont	32	32	3.4
	11	378	166	-----	double area		Fort Assinniboine, Mont	23	32	10.8
	12	117	-----	-----	-----	-----	Escanaba, Mich	13	21	2.7
	14	158	15	-----	-----	-----	Des Moines, Iowa	22	25	4.1
	17	-----	-----	-----	-----	-----	Atlanta, Ga	61	26	-----
	23	24	-----	-----	-----	-----	Moorhead, Minn	34	23	0.6
	24	229	68	-----	-----	-----	Parry Sound, Ont	33	36	6.3
	25	42	-----	-----	-----	-----	Boston, Mass	36	21	1.0
Oct.	3	36	-----	-----	-----	-----	North Platte, Nebr	56	25	0.8
	4	87	-----	-----	-----	-----	Fort Smith, Ark	64	24	2.0
	11	-----	-----	-----	-----	-----	Dodge City, Kans	64	24	-----
	12	49	-----	-----	-----	-----	Escanaba, Mich	59	22	1.1
	15	16	-----	-----	-----	-----	Denver, Colo	51	20	0.4
	16	339	45	-----	-----	-----	Fort Smith, Ark	71	33	8.8
	17	164	-----	-----	-----	-----	Columbus, Ohio	65	26	3.8
	18	200	-----	-----	-----	-----	Smithville, N. C	76	25	5.3
Nov.	1	34	-----	-----	-----	-----	Boston, Mass	61	37	0.8
	5	22	-----	-----	-----	-----	Denison, Tex	66	21	0.5
	6	85	-----	-----	-----	-----	Laredo, Tex	60	25	2.0
	7	282	25	-----	-----	-----	Montgomery, Ala	67	31	7.2
	8	15	-----	-----	-----	-----	Boston, Mass	60	21	0.4
	10	92	-----	-----	-----	-----	Palestine, Tex	64	23	2.1
	16	616	284	-----	-----	-----	Fort Sully, S. Dak	34	38	17.8
	17	418	-----	-----	-----	-----	Denison, Tex	46	27	9.7
	18	23	-----	-----	-----	-----	Fort Smith, Ark	36	26	0.5

TABLE I.—CATALOGUE OF COLD WAVES IN THE UNITED STATES, ETC.—Continued.

Date.	—20	—30	—40	—50	—60	Center of cold wave.	Temperature.	Fall of temperature.	Extent of cold wave.
1880.							°	°	
Nov. 19	96					New York City Columbus, Ohio	46 19	23 22	2.2
Dec. 2	272					Fort Sully, S. Dak	30	26	6.4
5	359	118				Keokuk, Iowa	49	38	9.9
6	415	97				Louisville, Ky	60	38	11.2
7	443	42				Lynchburgh, Va	53	32	11.4
9	103					Louisville, Ky	36	25	2.4
14	144					Fort Buford, N. Dak	35	30	3.4
15	10					Nashville, Tenn	56	23	0.2
27	772	278	6			La Crosse, Wis	25	40	19.4
28	426	111				Alpena, Mich	26	36	11.6
29	169	8		double area		Chatham, N. B	31	30	4.3
30	323					Cedar Keys, Fla	54	22	7.5
1881.									
Jan. 3	71					Des Moines, Iowa	23	24	1.7
6	317	61	19			Fort Buford, N. Dak	17	40	8.7
7	228					La Crosse, Wis	17	30	5.3
9	94					Dodge City, Kans	16	26	2.2
13	678	163	50			Cheyenne, Wyo	38	41	19.0
14	1135	694	259	154		Fort Sill, Ind. T	57	50	38.0
15	848	170	15			Montreal, Quebec	34	46	23.0
17	174					Fort Elliott, Tex	39	27	4.1
30	130	12				Yankton, S. Dak	27	27	3.2
Feb. 2	539	43				Knoxville, Tenn	59	34	13.8
11	74			double area		Lynchburgh, Va	57	20	1.7
12	143					New Orleans, La	67	28	3.3
13	164	25				Lynchburgh, Va	59	31	.43
15	90					Denver, Colo	4	22	2.1
16	31					Des Moines, Iowa	19	24	0.7
20	93					Norfolk, Va	65	32	2.2
23	424					Duluth, Minn	21	32	9.9
24	538	203	61			Montreal, Quebec	31	46	16.0
26	95	48				Fort Assiniboine, Mont	36	31	2.8
27	445	115				Kansas City, Mo	48	35	12.1
28	304					Indianapolis, Ind	53	29	7.1
Mar. 1	92	16				Parry Sound, Ont	35	31	2.4
3	417					Denison, Tex	59	26	9.7
4	132	18				Chattanooga, Tenn	58	30	3.4
15	73					Fort Elliott, Tex	52	26	1.7
26	53					Nashville, Tenn	64	26	1.2
30	133					Knoxville, Tenn	55	27	3.1
Oct. 5	471	39				Pittsburgh, Pa Boston, Mass	68 64	24 33	12.1
13	160					Kansas City, Mo	69	28	3.7
16	62					Milwaukee, Wis	68	28	1.4
18	75					Keokuk, Iowa	64	20	1.8
Nov. 9	15					Chicago, Ill	56	20	0.3
17	44					Denver, Colo	48	24	1.0
18	368	75				Kansas City, Mo	61	36	9.8
19	509	203	21			Denison, Tex	70	42	14.9
20	271					Knoxville, Tenn	66	38	6.3
24	43					Chattanooga, Tenn	48	24	1.0
25	263					Rockliffe, Ont	22	28	6.2
28	321	171				Quebec, Quebec	47	35	9.5
30	11					Kansas City, Mo	54	20	0.3

TABLE I.—CATALOGUE OF COLD WAVES IN THE UNITED STATES, ETC.—Continued.

Date.	—20	—30	—40	—50	—60	Center of cold wave.	Temperature.	Fall of temperature.	Extent of cold wave.
1881.							°	°	
Dec. 1	136	15				Fort Smith, Ark	63	37	3.5
2	51					Chattanooga, Tenn	56	22	1.2
7	111					Duluth, Minn	33	22	2.6
8	72	23				Rockliffe, Ont	39	37	2.0
13	183	11				Bismarck, N. Dak	24	32	4.7
14	431	83				Fort Smith, Ark	66	33	11.5
15	488	45				Knoxville, Tenn	63	30	12.6
16	40	42				Chatham, N. B	37	33	*0.9
21	30					Denison, Tex	54	22	0.7
22	11					Cairo, Ill	59	20	0.3
23	13					Atlanta, Ga	60	21	0.3
24	356	108				Boston, Mass	51	33	9.8
30	42					Huron, S. Dak	22	25	1.0
1882.									
Jan. 2	181					Savannah, Ga	52	24	4.2
9	97					Louisville, Ky	57	23	2.3
14	134	56				Milwaukee, Wis	35	35	3.8
16	497	89				Fort Custer, Mont	19	36	13.2
17	1101	539	14			Denison, Tex	60	44	32.5
21	388	149				St. Vincent, Minn	4	30	10.9
22	380					Milwaukee, Wis	38	35	8.9
23	537	214				Burlington, Vt	31	42	15.2
26	211					St. Vincent, Minn	14	30	4.9
27	155					Lamar, Mo	59	29	3.6
28	197					Omaha, Nebr	28	25	4.6
29	339					Chattanooga, Tenn	65	30	8.9
30	99					Smithville, N. C	59	29	2.3
Feb. 4	275	72		double area		St. Vincent, Minn	16	29	7.5
5	262					Jacksonville, Fla	68	25	6.2
7	309					Fort Custer, Mont	32	29	7.2
13	80	14				Des Moines, Iowa	55	25	2.1
16	516	291	152			Fort Buford, N. Dak	37	44	17.1
17	643	88	19	double area		Helena, Mont	28	40	17.1
18	651	393	16	double area		Quebec, Quebec	33	47	20.3
19	143	19				Omaha, Nebr	35	30	3.7
21	272	26		double area		Memphis, Tenn	66	30	7.0
22	212	29				Pittsburgh, Pa	57	32	5.5
Mar. 5	348					Cheyenne, Wyo	31	25	8.1
6	134	51				Denison, Tex	68	31	3.8
10	41					Memphis, Tenn	64	21	1.0
13	72					Fort Smith, Ark	59	25	1.7
18	143	40				Fort Buford, N. Dak	31	33	3.9
21	490	86				Fort Sill, Ind. T	66	31	13.0
22	124					Montgomery, Ala	65	21	2.9
24	408	119				St. Paul, Minn	33	37	11.2
25	175	43				Boston, Mass	41	23	4.7
27	112					St. Vincent, Minn	19	28	2.6
28	209	12				Parry Sound, Ont	42	30	5.3
30	343					Winnipeg, Man	14	33	8.0
Oct. 16	126					Yankton, S. Dak	62	27	2.9
31	23					Kansas City, Mo	66	22	0.5
Nov. 11	263	40				Cheyenne, Wyo	31	32	6.9
12	388	221	44			Fort Elliott, Tex. Kansas City, Mo	70 69	46 43	12.3

* The —20 surrounding —30 not measured.

TABLE I.—CATALOGUE OF COLD WAVES IN THE UNITED STATES, ETC.—Continued.

Date.	—20	—30	—40	—50	—60	Center of cold wave.	Temperature.	Fall of temperature.	Extent of cold wave.
1882.							°	°	
Nov. 13	482	77	----	----	----	Shreveport, La Palestine, Tex	68 65	32 32	12.7
14	335	72	----	----	----	Atlanta, Ga Pensacola, Fla	64 73	33 34	9.0
17	21	----	----	----	----	Fort Washakie, Wyo	18	29	0.5
Dec. 2	172	----	----	----	----	Fort Custer, Mont	44	24	4.0
7	708	307	88	----	----	Lamar, Mo	38	41	21.5
8	877	183	----	----	----	Cape Hatteras, N. C Wilmington, N. C	46 50	30 33	23.5
12	116	26	----	----	----	Assinniboine, Mont	32	37	3.1
13	283	18	----	----	----	Winnipeg, Man	12	32	7.2
14	70	----	----	----	----	Fort Buford, N. Dak	8	29	1.6
15	115	----	----	----	----	Keokuk, Iowa Omaha, Nebr	25 22	20 26	2.7
16	553	140	----	----	----	Brownsville, Tex	68	32	14.9
31	26	----	----	----	----	Huron, S. Dak	11	22	0.6
1883.									
Jan. 3	302	92	----	double area		Fort Stevenson, Mont	4	35	8.3
4	198	----	----	----	----	Kingston, Ont	25	22	3.6
8	229	----	----	----	----	Denver, Colo	44	27	5.3
9	421	48	----	double area		Rockliffe, Ont	1	30	10.9
10	82	----	----	----	----	Jacksonville, Fla	63	24	1.9
11	253	27	----	----	----	Des Moines, Iowa	27	32	6.5
13	574	26	----	----	----	Las Animas, Colo	39	34	14.6
14	554	129	----	----	----	Shreveport, La Duluth, Minn	60 60	34 38	14.9
15	386	----	----	----	----	Chatham, N. B	34	31	9.0
18	324	53	----	----	----	Yankton, S. Dak	20	25	8.5
19	322	111	----	double area		Dodge City, Kans	22	38	9.0
20	385	167	21	double area		Dodge City, Kans Corpus Christi, Tex	67	45	11.4
21	330	7	----	----	----	Sandusky, Ohio	36	34	8.3
22	498	118	56	----	----	Rockliffe, Ont	21	43	14.1
31	307	56	----	----	----	St. Vincent, Minn	11	39	8.1
Feb. 4	337	168	30	----	----	Shreveport, La	68	42	10.3
5	135	----	----	----	----	Washington City	66	34	3.1
7	111	----	----	----	----	Moorhead, Minn	7	23	2.6
8	85	----	----	----	----	Chattanooga, Tenn	62	29	1.9
9	62	----	----	----	----	St. Vincent, Minn	2	23	1.5
10	361	26	----	----	----	Montreal, Quebec	19	30	9.2
12	63	19	----	----	----	Des Moines, Iowa	30	34	1.7
16	789	174	19	----	----	Moorhead, Minn	30	42	21.6
17	1065	640	187	31	----	Keokuk, Iowa	60	60	35.4
18	752	274	128	----	----	Washington City Father Point, Quebec	60 54	30 50	22.6
25	189	----	----	----	----	Lamar, Mo	50	24	4.4
26	96	----	----	----	----	Parry Sound, Ont	37	27	2.2
Mar. 3	445	115	----	----	----	Pittsburgh, Pa Burlington, Vt	54 40	26 35	12.1
7	671	123	----	----	----	Springfield, Mo	53	35	17.9
8	384	31	----	----	----	Rockliffe, Ont	7	35	9.8
11	121	----	----	----	----	Parry Sound, Ont	31	27	2.8
12	357	54	----	----	----	Sydney, N. S	33	31	9.4
15	428	----	----	----	----	Moorhead, Minn	28	28	10.0

TABLE I.—CATALOGUE OF COLD WAVES IN THE UNITED STATES, ETC.—Continued.

Date.	—20	—30	—40	—50	—60	Center of cold wave.	Temperature.	Fall of temperature.	Extent of cold wave.
1883.							°	°	
Mar. 16	468	49	-----	-----	-----	Montreal, Quebec	36	38	12.1
18	664	497	244	109	-----	Winnipeg, Man	29	55	24.9
19	848	351	-----	-----	-----	{ Kansas City, Mo { Oswego, N. Y	53 47	38 37	} 24.1
20	250	-----	-----	-----	-----	Nashville, Tenn	59	33	5.8
21	96	-----	-----	-----	-----	Boston, Mass	50	29	2.2
Oct. 9	102	-----	-----	-----	-----	North Platte, Nebr	62	26	2.4
15	116	-----	-----	-----	-----	Boston, Mass	71	29	2.7
20	138	-----	-----	-----	-----	Mackinaw City, Mich	50	26	3.1
21	139	-----	-----	-----	-----	Eastport, Me	61	24	3.2
30	62	-----	-----	-----	-----	Little Rock, Ark	68	21	1.4
Nov. 6	350	-----	-----	-----	-----	Kansas City, Mo	65	29	8.1
7	155	-----	-----	-----	-----	{ Columbus, Ohio { Nashville, Tenn	55 62	21 22	} 3.6
12	298	-----	-----	-----	-----	Nashville, Tenn	63	29	6.9
13	231	-----	-----	double area		{ Savannah, Ga { Smithville, N. C	69 64	26 28	} 5.4
14	380	-----	-----	-----	-----	St. Paul, Minn	20	29	8.9
15	57	-----	-----	-----	-----	Lynchburgh, Va	49	23	1.3
21	27	-----	-----	-----	-----	Kansas City, Mo	60	22	0.6
26	830	289	100	-----	-----	Winnipeg, Man	29	44	24.4
27	567	80	-----	-----	-----	Louisville, Ky	63	33	14.8
28	77	-----	-----	-----	-----	Yarmouth, N. S	52	25	1.8
Dec. 2	173	58	-----	-----	-----	Duluth, Minn	34	35	4.8
3	145	13	-----	-----	-----	Parry Sound, Ont	38	36	3.7
7	80	-----	-----	-----	-----	Moorhead, Minn	38	26	1.9
8	262	-----	-----	-----	-----	La Crosse, Wis	50	26	6.1
10	44	-----	-----	-----	-----	Smithville, N. C	62	23	1.0
14	492	181	-----	-----	-----	Moorhead, Minn	33	40	13.8
15	971	291	122	-----	-----	Montreal, Quebec	41	49	28.2
17	16	-----	-----	-----	-----	Keokuk, Iowa	30	23	0.4
18	373	104	48	-----	-----	Bismarck, N. Dak	39	49	10.8
20	29	-----	-----	-----	-----	Father Point, Quebec	17	30	0.7
23	298	-----	-----	-----	-----	Yarmouth, N. S	24	30	7.0
25	169	-----	-----	-----	-----	Shreveport, La	66	25	3.9
26	92	-----	-----	-----	-----	Chattanooga, Tenn	55	23	2.1
27	451	81	17	-----	-----	Des Moines, Iowa	37	45	12.2
28	440	32	12	-----	-----	Pensacola, Fla	65	28	11.4
31	155	47	-----	double area		Palestine, Tex	66	33	4.3
1884.									
Jan. 2	297	102	-----	-----	-----	Mobile, Ala	61	36	8.3
3	374	43	-----	double area		Kitty Hawk, N. C	60	34	9.7
5	466	24	-----	-----	-----	Palestine, Tex	39	30	11.8
6	220	38	-----	-----	-----	Smithville, N. C	42	34	5.8
10	79	-----	-----	-----	-----	Cheyenne, Wyo	37	25	1.9
11	604	87	-----	-----	-----	Kansas City, Mo	35	31	15.8
12	157	-----	-----	-----	-----	Mobile, Ala	58	28	3.6
14	743	210	53	16	7	Moorhead, Minn	37	63	21.4
15	516	225	47	-----	-----	Rockliffe, Ont	9	46	15.6
18	170	61	38	15	-----	Winnipeg, Man	28	51	5.4
19	703	328	14	double area		{ Omaha, Nebr { Mackinaw City, Mich	37 30	41 43	} 21.0
20	160	-----	-----	-----	-----	Louisville, Ky	39	25	3.7
23	483	282	42	-----	-----	Fort Buford, N. Dak	23	45	15.3
24	844	123	-----	-----	-----	St. Louis, Mo	34	32	22.1
29	28	-----	-----	-----	-----	Winnipeg, Man	20	24	0.6

TABLE I.—CATALOGUE OF COLD WAVES IN THE UNITED STATES, ETC.—Continued.

Date.	—20	—30	—40	—50	—60	Center of cold wave.	Temperature.	Fall of temperature.	Extent of cold wave.
1884.							°	°	
Jan. 31	226					Milwaukee, Wis	44	25	5.3
Feb. 1	302					Pittsburgh, Pa	46	23	7.1
2	391			double area		Bismarck, N. Dak	32	30	9.1
6	208			double area		Pittsburgh, Pa	60	21	4.8
						Cheyenne, Wyo	29	28	
9	180					Dodge City, Kans	31	29	4.2
10	80					Louisville, Ky	59	24	1.8
13	150					Little Rock, Ark	67	30	3.5
14	360	43				Cincinnati, Ohio	55	35	9.4
15	399	51				Rockliffe, Ont	22	41	10.4
19	376			double area		Moorhead, Minn	16	31	8.8
20	895	298	65			Davenport, Iowa	45	42	26.4
21	350	86				Rockliffe, Ont	33	36	10.0
23	79					St. Paul, Minn	20	29	1.8
24	546	147				Father Point, Quebec	29	38	14.9
27	504	217	58			Moorhead, Minn	26	46	15.3
28	845	68				Milwaukee, Wis	27	36	21.7
29	662	81				Smithville, N. C	57	31	17.2
Mar. 3	140	43				Yankton, S. Dak	31	36	3.8
10	165					Charlotte, N. C	58	25	3.8
12	468	50				Fort Smith, Ark	66	32	12.1
Oct. 8	170	21				Dodge City, Kans	63	30	4.4
9	180					Detroit, Mich	68	29	4.2
21	53					Dodge City, Kans	60	25	1.2
22	48					Keokuk, Iowa	63	23	1.1
23	53					Rochester, N. Y	64	28	1.2
29	57					Montreal, Quebec	53	22	1.3
Nov. 5	26					Louisville, Ky	58	21	0.6
6	27					Boston, Mass	54	21	0.6
17	150					Duluth, Minn	44	29	3.5
18	63	10				Quebec, Quebec	42	31	1.5
23	530	74	21			Kansas City, Mo	52	40	14.2
24	682	341	34			Indianapolis, Ind	56	44	20.7
25	225	16				Eastport, Me	53	31	5.8
28	56					St. Louis, Mo	54	26	1.3
29	31					Mobile, Ala	65	25	0.7
Dec. 11	62					Huron, S. Dak	29	24	1.4
12	100					Corpus Christi, Tex	70	27	2.3
13	51					Atlanta, Ga	64	26	1.2
						Chattanooga, Tenn	61	26	
15	248					Moorhead, Minn	20	35	5.8
16	205					Duluth, Minn	39	23	4.8
17	64	10				St. Louis, Mo	39	33	1.7
18	336	9				Nashville, Tenn	46	32	9.5
19	434	88		double area		Fort Macon, N. C	53	38	11.6
22	238					Yankton, S. Dak	4	25	5.5
23	377	43				Pittsburgh, Pa	48	33	9.8
24	232	99	45	8		Denver, Colo	48	50	7.3
						Chatham, N. B	32	38	
25	226					Fort Davis, Tex	42	26	5.2
31	391	68	17			Palestine, Tex	64	41	10.6
1885.									
Jan. 1	1060	305	46			Parry Sound, Ont	47	45	29.9
2	901	396	45			Chatham, N. B	41	42	26.8
9	457	135				Winnipeg, Man	25	35	12.6
10	283	65				Parry Sound, Ont	37	34	7.6

TABLE I.—CATALOGUE OF COLD WAVES IN THE UNITED STATES, ETC.—Continued.

Date.		—20	—30	—40	—50	—60	Center of cold wave.	Temperature.	Fall of temperature.	Extent of cold wave.
1885.								°	°	
Jan.	11	340	109		double area		Chatham, N. B	36	34	8.3
	12	869	260	36			Duluth, Minn	26	47	24.6
	13	590	210	67	17		Rockliffe, Ont	33	54	17.7
	16	625	84				Palestine, Tex	51	35	16.3
	17	415	188	23			Montgomery, Ala	68	45	12.4
	18	487	109	26			Norfolk, Va	68	41	13.5
	21	269	62				Fort Buford, N. Dak	0	35	7.2
	22	397	124				Parry Sound, Ont	4	37	10.9
	24	76					Helena, Mont	24	21	1.8
	25	319	19				Kansas City, Mo	31	31	8.1
	26	85					Indianapolis, Ind	24	23	2.0
	27	607	116				Rockliffe, Ont	7	39	16.1
	28	195	60				Cairo, Ill	38	34	5.4
	29	205	27				New Haven, Conn	40	30	5.4
Feb.	1	180	35				Moorhead, Minn	17	36	4.8
	2	311	77	22			Parry Sound, Ont	10	43	8.7
	5	439	126				Bismarck, N. Dak	39	35	12.0
	6	214					Columbus, Ohio	34	32	5.0
	7	41					Fort Custer, Mont	36	22	1.0
	8	244					Kansas City, Mo. Des Moines, Iowa	36 26	22 26	5.7
	9	136					Fort Apache, Ariz	42	25	3.2
	10	960	261	22			Nashville, Tenn	62	44	25.8
	11	787	397	96	8		Cape Henry, Va	64	50	24.7
	13	17					Springfield, Ill	25	23	0.4
	15	110					Prince Albert, Sask	6	28	2.6
	16	155	62				St. Louis, Mo	38	39	4.4
	17	282	34				Toronto, Ont	29	40	7.3
	18	186			double area		North Platte, Nebr	28	31	4.3
	19	237					Montgomery, Ala	50	24	5.5
Mar.	2	64					Alpena, Mich	31	24	1.5
	10	248	26				Marquette, Mich	29	31	6.4
	11	114					Rockliffe, Ont	5	27	2.6
	13	79					Oswego, N. Y	16	24	1.8
	15	356	19				St. Paul, Minn	42	31	9.0
	16	404	68				Moorhead, Minn	15	31	10.6
	17	216					Cincinnati, Ohio Rockliffe, Ont	30 0	21 28	5.0
	19	57					Minnedosa, Man	10	22	1.3
	22	37					Corpus Christi, Tex	65	23	0.8
	23	30					Mobile, Ala	53	22	0.7
	24	161					Moorhead, Minn	25	23	3.7
	25	95					Parry Sound, Ont	19	30	2.2
	28	157					Parry Sound, Ont	30	28	3.7
	29	379					Quebec, Quebec	32	26	8.8
Oct.	4	26					Detroit, Mich	65	23	0.6
	5	80					Rockliffe, Ont	61	29	1.8
	21	63					Toronto, Ont	60	25	1.4
Nov.	7	70					Springfield, Mo	64	29	1.6
	8	62					Columbus, Ohio Sandusky, Ohio	63 65	23 26	1.4
	12	552	24				Denver, Colo	54	38	14.0
	13	460	51				Fort Smith, Ark	63	34	11.9
	14	177					Atlanta, Ga	61	26	4.1
	18	12					Las Animas	46	21	0.3
	19	52					Little Rock, Ark	61	22	1.2

TABLE I.—CATALOGUE OF COLD WAVES IN THE UNITED STATES, ETC.—Continued.

Date.		—20	—30	—40	—50	—60	Center of cold wave.	Temperature.	Fall of temperature.	Extent of cold wave.
								°	°	
1885.										
Nov.	20	77					Boston, Mass	54	24	1.8
	23	54					Memphis, Tenn	62	25	1.3
	24	134					Wilmington, N. C	64	24	3.1
Dec.	4	124	22				Medicine Hat, Assin	50	33	3.3
	5	864	299				Kansas City, Mo	50	35	24.1
							Des Moines, Iowa	44	38	
	6	457	45		double area		Smithville, N. C	60	32	11.8
	7	86					Chicago, Ill	22	25	2.0
	9	489	134				Shreveport, La	67	33	13.4
	10	252	11				Columbus, Ohio	60	34	6.4
	11	221					Norfolk, Va	62	28	5.2
	13	146			double area		Corpus Christi, Tex	66	29	3.4
	14	91					Pensacola, Fla	61	29	2.1
	15	198			triple area		Savannah, Ga	60	28	4.6
	16	84					Chatham, N. B	30	29	1.9
	19	86	7				Moorhead, Minn	33	30	2.2
	20	25	5				Parry Sound, Ont	31	32	0.6
	21	66					Quebec, Quebec	22	23	1.5
	23	154	33				Winnipeg, Man	37	34	4.1
	24	254	10				Duluth, Minn	35	30	6.4
	25	351	98				Chatham, N. B	38	37	9.6
	30	169	62	24			Minnedosa, Man	30	43	5.1
1886.										
Jan.	3	304	80		double area		Palestine, Tex	64	33	8.3
	4	352	28				New Orleans, La	68	30	9.0
	5	189			double area		Charlotte, N. C	62	28	4.4
	6	405	109	27	double area		Rockliffe, Ont	38	45	11.4
	7	505	131	75	double area		Cheyenne, Wyo	23	46	14.6
	8	711	230	21			Corpus Christi, Tex	51	37	20.2
	9	397	163				Montgomery, Ala	47	39	11.3
	14	207	85				Fort Assinniboine, Mont	27	30	5.9
	16	138	15				Omaha, Nebr	31	32	3.6
	17	326	12				Chicago, Ill	36	30	9.2
	18	192	125	36			Rockliffe, Ont	28	43	6.4
	22	144	23		double area		Denver, Colo	40	34	3.8
	23	619	193				Sault de Ste. Marie, Mich	24	37	17.1
	24	395	244	71			Chatham, N. B	32	48	12.7
Feb.	1	114	35				Qu' Appelle, Assin	1	33	3.1
	2	164			double area		Huron, S. Dak	8	29	3.8
	3	410	84		double area		Fort Davis, Tex	53	35	11.0
	4	234					Montgomery, Ala	53	31	5.4
	9	308	69				St. Vincent, Minn	34	33	8.3
	10	132			double area		Springfield, Mo	51	20	3.1
							Fort Davis, Tex	56	22	
	16	201					Knoxville, Tenn	58	33	4.7
	19	311	25				Huron, S. Dak	33	33	7.5
	20	402	117				Saugeen, Ont	34	37	11.0
	21	331	49				Quebec, Quebec	15	39	8.7
	25	708	345	158			Winnipeg, Man	25	47	22.4
	26	606	245	29			Mackinaw City, Mich	39	42	17.8
	27	153	22				Portland, Me	34	32	4.0
Mar.	8	118					Qu' Appelle, Assin	17	27	2.7
	9	125					Marquette, Mich	28	25	2.9
	10	41			double area		Shreveport La	50	20	1.0
							Rockliffe, Ont	5	22	
	20	27					Kansas City, Mo	58	23	0.6

TABLE I.—CATALOGUE OF COLD WAVES IN THE UNITED STATES, ETC.—Continued.

Date.		—20	—30	—40	—50	—60	Center of cold wave.	Temperature.	Fall of temperature.	Extent of cold wave.
1886.								°	°	
Mar.	21	144					Indianapolis, Ind	59	27	3.4
	27	83			double area		Helena, Mont	28	27	1.9
	28	72					Denver, Colo	16	24	1.7
	30	27					Galveston, Tex	63	21	0.6
	31	48					Qu' Appelle, Assin	55	35	1.1
Oct.	1	79					Davenport, Iowa	55	25	1.8
	15	63					Minnedosa, Man	59	23	1.5
	16	279					Boston, Mass	65	26	6.5
	20	96					North Platte, Nebr	58	27	2.2
	21	176					Marquette, Mich	66	30	4.1
	25	81					Duluth, Minn	52	20	1.9
Nov.	2	28					Dodge City, Kans	54	20	0.6
	6	65					Alpena, Mich	45	24	1.5
	7	174					Vicksburg, Miss	60	25	4.1
	11	155	36				Montrose, Colo	49	36	4.2
	12	77					Shreveport, La	69	30	1.8
	13	155					Chattanooga, Tenn	60	28	3.6
	14	16					Wilmington, N. C	54	22	0.4
	17	541	35				Galveston, Tex	69	25	13.8
	18	450	116				New Orleans, La	74	39	12.4
	19	325	91				Wilmington, N. C	72	36	8.9
	22	51					Fort Custer, Mont	24	23	1.2
	23	456	108	17			Kansas City, Mo	61	41	12.6
	24	472	159				Nashville, Tenn	69	35	13.1
	26	302	130				Wilmington, N. C	68	33	8.6
Dec.	1	418	151	53	21		Bismarck, N. Dak	35	52	12.6
	2	337					Indianapolis, Ind	27	29	7.9
	3	57					Eastport, Me	32	22	1.3
	4	278			double area		Fort Davis, Tex	52	26	6.5
	5	307	23				Pensacola, Fla	62	31	7.9
	6	20					Jacksonville, Fla	53	24	0.5
	12	34					Dodge City, Kans	43	26	0.8
	14	58					St. Vincent, Minn	10	20	1.4
	15	803	144	27			Yankton, S. Dak	42	43	21.8
	16	315	15				Pensacola, Fla	58	30	8.0
	19	97					St. Vincent, Minn	13	27	2.3
	21	118	21				Huron, S. Dak	32	33	3.1
	23	269	52		double area		Helena, Mont	32	30	7.2
	24	101					Duluth, Minn	19	27	2.4
	25	231	47	9			Parry Sound, Ont	30	40	6.3
	26	531	165		double area		Halifax, N. S	57	39	14.7
	27	264	37				Chicago, Ill	29	37	7.0
1887.										
Jan.	1	739	72				Des Moines, Iowa	15	31	19.1
	2	511	78				Wilmington, N. C	59	34	13.4
	6	432	90				Fort Buford, N. Dak	1	36	11.6
	7	118	44				Rockliffe, Ont	12	31	3.3
	12	253	150		75		St. Vincent, Minn	20	52	8.5
	13	303	87	22			Rockliffe, Ont	12	43	8.6
	16	361	41		triple area		Minnedosa, Man	10	32	9.4
	17	621	139				Lamar, Mo	53	42	16.2
	18	660	156				Chattanooga, Tenn	58	40	17.8
	19	360	176	36			Halifax, N. S	40	43	11.0
	20	224					Fort Assinniboine, Mont	22	33	5.2
	21	239	81				La Crosse, Wis	37	40	6.6
	22	345	191				Chatham, N. B	37	47	11.2

TABLE I.—CATALOGUE OF COLD WAVES IN THE UNITED STATES, ETC.—Continued.

Date.		—20	—30	—40	—50	—60	Center of cold wave.	Temperature.	Fall of temperature.	Extent of cold wave.
								°	°	
1887.										
Jan.	23	222	23				Kansas, City, Mo	56	35	5.8
	24	369					Knoxville, Tenn	63	29	8.6
	25	558			triple area		Winnipeg, Man	1	30	13.0
	26	379	36				Sault de Ste. Marie, Mich	25	33	9.8
	27	660	148				Eastport, Me	34	40	17.7
	29	513	115	38	double area		Fort Custer, Mont	37	43	14.3
	30	474	271				Yankton, S. Dak	30	42	14.1
	31	270	98	34			Parry Sound, Ont	30	46	8.0
Feb.	1	215	67	10	double area		Fort Elliott, Tex	45	40	5.9
	3	99					Moorhead, Minn	28	28	2.3
	4	336	98	19			{ Palestine, Tex { Pittsburgh, Pa	67 58	42 34	9.5
	5	288					Halifax, N. S	34	31	6.7
	9	426	82				Alpena, Mich	46	38	11.3
	10	380	144	35	double area		Rapid City, S. Dak	36	43	11.2
	11	543	205	117	19		Lamar, Mo	63	54	16.9
	12	1015	319	97			Columbus, Ohio	63	44	29.4
	18	233	45		double area		Chatham, N. B	27	37	5.4
	19	140					Louisville, Ky	58	25	3.2
	24	326	46				Des Moines, Iowa	33	32	8.5
	25	446	115	38			Rockliffe, Ont	21	43	12.6
	27	454	48				Louisville, Ky	58	32	11.8
	28	154	16				Rockliffe, Ont	24	31	4.0
Mar.	2	538	192	27			Fort Buford, N. Dak	45	49	15.6
	3	219					{ St. Louis, Mo { Escanaba, Mich	60 25	27 33	5.1
	4	85					La Crosse, Wis	24	22	2.0
	7	331	189				Qu' Appelle, Assin	27	43	9.8
	8	120					Parry Sound, Ont	34	31	2.8
	9	83			double area		Burlington, Vt	32	27	1.9
	10	55					Sault de Ste. Marie, Mich	9	22	1.3
	13	471	113	21			Winnipeg, Man	33	43	13.1
	14	227					Cincinnati, Ohio	54	30	5.3
	15	56					Albany, N. Y	36	25	1.3
	24	170	62				St. Vincent, Minn	32	35	4.6
	25	103					Alpena, Mich	35	27	2.4
	26	72					Quebec, Quebec	28	24	1.7
	28	227					Shreveport, La	64	29	5.3
	29	307					Jacksonville, Fla	60	23	7.1
Oct.	8	54					Montrose, Colo	64	28	1.3
	9	27					Concordia, Kans	64	20	0.6
	23	140					Fort Custer, Mont	34	22	2.9
	25	44					San Antonio, Tex	72	24	1.0
	30	53					Indianapolis, Ind	46	22	1.2
Nov.	4	29					Yankton, S. Dak	50	24	0.7
	5	158	18				Oswego, N. Y	58	30	3.9
	8	148					Sault de Ste. Marie, Mich	52	24	3.4
	11	19					Knoxville, Tenn	55	22	0.4
	17	75					Springfield, Mo	56	24	1.7
	19	276	51				Swift Current, Assin	40	36	6.9
	20	203	10		double area		St. Louis, Mo	46	30	5.1
	21	204	32				Cedar Keys, Fla	62	34	5.4
	22	408	104				Fort Buford, N. Dak	32	30	11.0
	23	178					Fort Sully, S. Dak	28	28	4.1
	24	43					Little Rock, Ark	64	20	1.0
	26	103	20				Cheyenne, Wyo	28	34	2.7

TABLE 1.—CATALOGUE OF COLD WAVES IN THE UNITED STATES, ETC.—Continued.

Date.	—20	—30	—40	—50	—60	Center of cold wave.	Temperature.	Fall of temperature.	Extent of cold wave.
1887.							°	°	
Nov. 27	891	525	118			Fort Elliott, Tex	38	42	28.5
28	806	367	126	31		Louisville, Ky	68	58	25.3
29	373	158	23			Philadelphia, Pa	62	36	11.1
Dec. 4	356	24				Fort Sill, Ind. T	62	24	9.1
5	544	51				Duluth, Minn	34	36	14.0
6	47					Lynchburgh, Va	52	22	1.1
9	82	31				Qu'Appelle, Assin	30	34	2.3
12	17					La Crosse, Wis	24	22	0.4
18	59					Jacksonville, Fla	62	22	1.4
19	659	200	18			St. Vincent, Minn	20	42	18.6
20	751	123	26			North Platte, Nebr	30	48	20.2
21	338	76	7			St. Louis, Mo	42	42	9.2
22	23					St. Paul, Minn	12	26	0.5
23	10					Rockliffe, Ont	4	20	0.2
24	141	50				Yankton, S. Dak	34	38	3.9
26	139					Fort Buford, N. Dak	10	30	3.2
27	173					Port Arthur, Ont	16	32	4.0
28	564	195	24			Keokuk, Iowa	32	42	16.2
29	830	85				Wilmington, N. C	60	32	21.4
30	226	68				Yarmouth, N. S	32	36	6.2
1888.									
Jan. 1	422	60		double area		Palestine, Tex	64	40	11.0
2	244					Knoxville, Tenn	54	30	5.7
5	49					Cheyenne, Wyo	40	30	1.2
7	246	24				Springfield, Mo	58	34	6.4
8	525	158	26	double area		{Palestine, Tex {Moorhead, Minn	68 16	48 38	14.7
13	641	217	75			Valentine, Nebr	30	50	18.8
14	657	159	29	double area		Toledo, Ohio	40	36	18.3
15	513	255	58			Palestine, Tex	48	44	15.8
16	443	139				Oswego, N. Y	38	36	12.2
19	193	16		double area		Cedar Keys, Fla	64	34	5.0
20	235	30				Cheyenne, Wyo	34	42	6.1
	(A large 20-and-30 area in the north-west not measured.)								
Feb. 4	185					Chatham, N. B	16	34	4.3
5	244	26				La Crosse, Wis	38	28	6.3
7	166	53	9			Huron, S. Dak	30	48	4.7
8	119					Springfield, Ill	30	26	2.6
9	385					Fort Buford, N. Dak	4	30	9.0
10	334	143				Halifax, N. S	36	32	9.5
14	774	353	72			Yankton, S. Dak	40	50	23.5
15	912	229	46			Detroit, Mich	36	42	25.5
16	440	82				Boston, Mass	38	40	11.1
20	280	59				{Dubuque, Iowa {Minnedosa, Man	42 14	27 34	7.5
21	116					Escanaba, Mich	34	24	2.7
25	210	58				Moorhead, Minn	34	42	5.7
26	260	74				Toledo, Ohio	48	34	7.1
27	70					Rockliffe, Ont	26	40	1.6
Mar. 2	287	34				Fort Sill, Ind. T	58	30	7.4
3	478	87				St. Louis, Mo	60	36	12.6
4	38					Philadelphia, Pa	38	22	0.9
9	15					Valentine, Nebr	32	26	0.4
10	224	18				Concordia, Kans	48	36	5.8
11	796					Duluth, Minn	28	30	18.6

TABLE I.—CATALOGUE OF COLD WAVES IN THE UNITED STATES, ETC.—Continued.

Date.		—20	—30	—40	—50	—60	Center of cold wave.	Temperature.	Fall of temperature.	Extent of cold wave.
1888.								°	°	
Mar.	12	278					Charleston, S. C	60	24	6.5
							Cedar Keys, Fla	65	27	
	15	184	80				Prince Albert, Sask	18	38	5.3
	16	47					St. Paul, Minn	34	28	1.1
	17	160					Alpena, Mich	24	24	3.7
	19	378	97	28			Qu'Appelle, Assin	40	48	10.6
	20	283	49				Keokuk, Iowa	56	40	7.5
	21	422	87				Bismarck, N. Dak	34	40	11.3
	22	486	25				Escanaba, Mich	28	30	12.3
	25	94					Rapid City, S. Dak	42	24	2.2
	26	25					Lamar, Mo	52	20	0.6
	27	19					St. Louis, Mo	52	22	0.4
Oct.	2	174					Rapid City, S. Dak	60	28	4.1
	19	111					Concordia, Kans	62	28	2.6
	20	149					Fort Smith, Ark	68	30	3.5
Nov.	2	60					Omaha, Nebr	62	26	1.4
	3	204					Indianapolis, Ind	68	26	4.8
							Fort Smith, Ark	70	24	
	6	50					Lamar, Mo	68	28	1.2
	7	90					Rochester, N. Y	66	26	2.1
	9	176					Vicksburg, Miss	68	24	4.1
	10	72					Chattanooga, Tenn	68	24	1.7
	11	115					Wilmington, N. C	72	26	2.7
	16	44					Milwaukee, Wis	46	24	1.0
	21	90					Sydney, N. S	46	28	2.1
Dec.	3	49					North Platte, Nebr	38	22	1.1
	5	102					Fort Assinniboine, Mont	50	28	2.4
	6	10					Rockliffe, Ont	32	20	0.2
	11	232	14				Moorhead, Minn	28	30	5.9
	16	31					Crete, Nebr	54	29	0.7
	21	383	24				Port Arthur, Ont	26	32	9.8
	22	125	38				Kingston, Ont	32	40	3.4
	24	67					Rapid City, S. Dak	40	24	1.6
	25	80					Des Moines, Iowa	52	32	1.9
	26	102					Springfield, Mo	52	26	2.4
	27	144					Springfield, Ill	52	30	2.2
	28	33					Montreal, Quebec	44	24	0.8
1889.										
Jan.	9	259	28		double area		Palestine, Tex	56	26	4.7
							Fort Buford, N. Dak	22	34	
	10	161					Milwaukee, Wis	38	26	3.8
	17	551	60				St. Paul, Minn	38	32	14.3
							Minnedosa, Man	16	34	
	18	280					St. Vincent, Minn	10	26	6.5
	20	163					Huron, S. Dak	10	30	3.8
	21	139					Keokuk, Iowa	30	26	3.2
	26	464	245	86			Moorhead, Minn	24	50	14.8
	27	220			double area.		Fort Smith, Ark	44	30	5.1
	28	33					Chattanooga, Tenn	54	26	0.8
	31	285	123				Winnipeg, Man	14	38	8.1
Feb.	3	90					White River, Ont	22	34	2.1
	4	60			double area		Father Point, Quebec	6	32	1.2
	5	658	339	171	41		Moorhead, Minn	18	54	21.4
	6	356	81				Port Huron, Mich	36	46	9.6
	16	63					Fort Elliott, Tex	50	24	1.5
	17	372	39				St. Paul, Minn	28	34	9.6

TABLE I.—CATALOGUE OF COLD WAVES IN THE UNITED STATES, ETC.—Continued.

Date.		—20	—30	—40	—50	—60	Center of cold wave.	Temperature.	Fall of temperature.	Extent of cold wave.
1889.								°	°	
Feb.	18	324			double area		Palestine, Tex Rockliffe, Ont	56 38	28 34	7.6
	19	326	36				Augusta, Ga	70	34	8.4
	21	139					Qu'Appelle, Assin	4	28	2.2
	22	489	147				La Crosse, Wis	20	36	13.4
	23	634	320	87			Erie, Pa Kingston, Ont	32 34	40 46	10.8
	24	163	71				Sydney, N. S	36	46	4.7
Mar.	13	371	75				Minnedosa, Man	24	34	9.9
	15	65					Concordia, Kans	52	28	1.5
	16	42					Springfield, Mo	54	22	1.0
	27	36					Moorhead, Minn	42	26	0.8
	29	26					do	26	20	0.6
Nov.	2	55					Nashville, Tenn	66	22	1.3
	3	69					Sandusky, Ohio	66	26	1.6
	4	94			double area		Lynchburgh, Va	68	22	2.2
	7	74					Minnedosa, Man	34	22	1.7
	11	497					St. Vincent, Minn	38	32	11.6
	12	205					El Paso, Tex	50	22	4.8
	13	203			double area		Galveston, Tex	70	28	4.7
	15	46					Northfield, Vt	46	24	1.1
	18	53					Jacksonville, Fla	70	26	1.2
	28	120					Mobile, Ala	64	24	2.8
Dec.	9	411	150				St. Vincent, Minn	30	38	11.5
	11	334					Springfield, Mo St. Vincent, Minn	62 24	26 28	7.8
	14	124					Rochester, N. Y	48	26	2.9
	15	47					Indianapolis, Ind	62	26	1.1
	17	110					Kansas City, Mo	54	20	2.5
	19	316	118				St. Vincent, Minn	34	42	8.9
	20	142	33				Port Arthur, Ont	32	30	3.8
	25	258	36				Des Moines, Iowa	60	34	6.8
	26	15					Huron, S. Dak	16	24	0.4
	27	202					Parkersburgh, W. Va	62	30	4.7
	29	566	190				St. Vincent, Minn	24	44	15.7
	30	749	228	16			Chicago, Ill	60	44	21.1
	31	408	79				Eastport, Me	48	40	10.8

In a cold wave the temperature-falls on a map have graphically the semblance of a cone. The altitude of the cone is the greatest fall in temperature. The temperature-fall lines represent the section lines of planes with the cone. Table I gives the extent of fall below the 20° fall curve. It includes none of the fall less than 20°. The amount of the fall, however, less than 20° is important, as became apparent as this investigation progressed. The area included by the 10° fall curve, even in the case of the smallest cold wave, is rarely less than 500,000 square miles. In many cases it amounts to 1,500,000 square miles or more.

In Table I many of the areas given are only approximate. In some cases the areas extended beyond the region covered by observation stations and the curves had to be inclosed by estimation as best they could. This has not introduced any great inaccuracies however, except in a few cases where only the western side of a temperature-fall area was visible along the Atlantic coast, and the position of its eastern border out in the Atlantic Ocean had to be estimated.

The areas were measured with a "rolling" planimeter on maps of the United States on a scale of $\frac{1}{10100000}$, or about 1 inch to 160 miles.

The areas of the 10° falls of temperature of certain of the cold waves, which have been made the subject of investigation, are given in Table XIV.

In many of these cases the allowance to be made to the extent of cold wave for area of fall between 10° and 20° is five or six times as much as the extent of cold wave below 20°. In the case of large cold waves, with a 20° fall area of more than 1,000,000 square miles, the fall between 10° and 20° only adds a small part to its extent.

The area outside of the 10° fall line to the zero-fall is not usually measurable with any exactness on account of the ill-defined position of the zero-fall line.

The areas were all measured on the a. m. temperature-change maps. Beginning July 1, 1888, the weather maps of the Signal Service have been based on observations made at 8 a. m. and 8 p. m. Previous to that time the observations were made three times a day at 7 a. m., 3 p. m., and 10 p. m. The last observation of the day in some of the earlier years was made at 11 p. m.

All that is given here pertains to the a. m. maps of the various years and deals exclusively with the twenty-four hour temperature-falls.

It is taken for granted that what is true concerning temperature-falls from 7 a. m. of one day to 7 a. m. of the next will also hold good for the interval 8 a. m. to 8 a. m.

This investigation does not touch on the temperature-falls of the 3 p. m. map. That observation having been discontinued, it would be of only limited practical interest to establish anything in relation to those changes. This map is very important, however, as in many cases of very severe cold waves the low temperatures become first apparent on this map in the afternoon in the far Northwest. The data is so very extensive that a limitation had to be made, and therefore no discussion of the 10 p. m. or 11 p. m. weather maps was undertaken.

This investigation of cold waves is based on maps, going back as far as 1880. The material in 1880 and 1881 west of the Mississippi River is not, however, as well adapted for the purpose as that of the later years. Observing stations in the western country were very few at that time. Moreover, the reduction of barometric pressure to sea-level previous to 1882 was made on a different plan from that in use since then.

Many of the foregoing temperature-falls, though classed as cold waves, are practically unimportant. In the case of areas of less than 100,000 square miles the lowest accompanying temperatures are usually not lower than freezing-point. These occurring in the early morning are not much noticed. Where the areas of change are small the low temperature does not last long, and by the time the sun has risen there is a rise of 8° or 10° in the temperature.

A temperature change to be of importance ought to exceed somewhat the limit of the diurnal range of temperature at the place for the time of the year. If the change is less than this the lower temperature should at least go below 32° to be considered a cold-wave.

In the Western country, and especially at elevated stations, the diurnal range is much greater than in the East and at stations near sea-level. The following average values are taken from "American Weather." At New York and New Orleans the diurnal range of temperature is 15° in January and 12° in July. At El Paso, Western Texas, it is 25° in January and 33° in May. At St. Vincent, Minn., it is 23° in January and 25° in August. At Fort Apache, Ariz., at an elevation of 5,050 feet, it is 29° in January and 45° in September. At Tatoosh Island, Washington, it is 7° in January and 11° in July. At Campo, in southern California, at an elevation of 2,710 feet, the range in September is 45.4°. The diurnal range is the average difference for the month between the highest and lowest temperatures of the day.

In Table II is given a résumé of the cold waves of different magnitudes occurring in the various months and years. The magnitudes are arranged according to the areas of the 20° temperature-falls, 50,000 to 100,000 square miles being the smallest, 100,000 to 200,000 square miles the next in size, then 200,000 to 300,000, and so on increasing by 100,000 square miles up to the area 1,100,000 to 1,200,000 square miles.

TABLE II.—NUMBER OF COLD WAVES OF VARIOUS EXTENT, OCTOBER TO MARCH, 1880 TO 1889, INCLUSIVE.

[Arranged according to areas in square miles of 20° temperature-falls.]

Month.	50,000 to 100,000.	100,000 to 200,000.	200,000 to 300,000.	300,000 to 400,000.	400,000 to 500,000.	500,000 to 600,000.	600,000 to 700,000.	700,000 to 800,000.	800,000 to 900,000.	900,000 to 1,000,000.	1,000,000 to 1,100,000.	1,100,000 to 1,200,000.
1880.												
January	2	7	3	4	1				1			
February	4	1	3	1	3	3						
March	3	3	2	2								
October	3	1	1	1								
November	4		1		1		1					
December		3	1	2	3			1				
1881.												
January	2	2	1	1			1		1			1
February	5	2		1	2	2						
March	3	2			1							
October	2	1			1							
November	2		2	2		1						
December	5	3		1	2							
1882.												
January	2	4	1	3	1	1						1
February	1	1	4	1		1	2					
March	2	5	1	2	2							
October	1											
November			1	2	1							
December	2	3	1			1		1	1			
1883.												
January	1	1	2	6	2	3						
February	4	3		2				2			1	
March	1	1	1	2	3		2		1			
October	1	4										
November	2	1	1	3		1			1			
December	4	4	2	1	3					1		
1884.												
January	2	3	3	1	2	1	1	2	1			
February	2	2	1	6		2	1		2			
March		2			1							
October	4	2										
November	2	1	1			1	1					
December	3	1	5	3	1							
1885.												
January	2	1	3	3	3	1	2			1	1	
February	1	5	4	1	1			1		1		
March	6	3	2	2	1							
October	3											
November	5	2			1	1						
December	5	4	4	1	2				1			
1886.												
January		4	1	5	1	1	1	1				
February	1	4	1	3	2		1	1				
March	4	3										
October	4	1	1									
November	3	3		2	3	1						
December	4	2	4	3	1	1			1			
1887.												
January		1	5	5	3	3	3	1				
February	1	2	2	3	3	2					1	
March	5	3	3	2	1	1						
October	3	1										
November	2	4	3	1	1					2		
December	3	3	1	2		2	1	1	1			

TABLE II.—NUMBER OF COLD WAVES OF VARIOUS EXTENT, ETC.—Continued.

Month.	50,000 to 100,000.	100,000 to 200,000.	200,000 to 300,000.	300,000 to 400,000.	400,000 to 500,000.	500,000 to 600,000.	600,000 to 700,000.	700,000 to 800,000.	800,000 to 900,000.	900,000 to 1,000,000.	1,000,000 to 1,100,000.	1,100,000 to 1,200,000.
1888.												
January	1	1	3		2	2	2					
February	1	4	4	2	1			1		1		
March	3	2	4	1	3			1				
October		3										
November	6	2	1									
December	4	4	1	1								
1889.												
January	1	3	3	1	1	1						
February	3	2		4	1	2						
March	3											
October												
November	6	1	2		1							
December	1	3	2	2	2	1			1			

In Table III are given the total number of cold waves of various magnitudes occurring in ten years during the months of October, November, December, January, February, and March. The whole number is 621.

TABLE III.—WHOLE NUMBER OF COLD WAVES 1880 to 1890. ACCORDING TO EXTENT OF 20° TEMPERATURE-FALL AREAS.

	Jan.	Feb.	Mar.	Oct.	Nov.	Dec.	Sums.
50,000 to 100,000 square miles	13	23	30	21	32	31	150
100,000 to 200,000 square miles	27	26	24	13	14	30	134
200,000 to 300,000 square miles	25	19	13	2	12	21	92
300,000 to 400,000 square miles	29	24	11	1	10	16	91
400,000 to 500,000 square miles	16	13	12	1	8	14	64
500,000 to 600,000 square miles	13	10	1		5	5	34
600,000 to 700,000 square miles	9	6	2		1	1	19
700,000 to 800,000 square miles	4	5	1			3	13
800,000 to 900,000 square miles	3	2	1		1	5	12
900,000 to 1,000,000 square miles	1	2			2	1	6
1,000,000 to 1,100,000 square miles	1	2					3
1,100,000 to 1,200,000 square miles	2	1					3

In Table IV, the sums of "Extent of cold waves" are given for the different months. The ratio of the numbers express in some measure the relative prevalence of great temperature-falls in the different months for the whole United States. Taking October the lowest as a standard of comparison, November has five times as much area of 20° fall as October; December, eight times as much; January, thirteen times as much: February, eleven times as much, and March, five times as much.

TABLE IV.—SUMS OF "EXTENT OF COLD WAVES" BY MONTHS.

[Unit cold-wave equals a 20° fall of temperature over an area of 50,000 square miles.]

Year.	Jan.	Feb.	Mar.	Oct.	Nov.	Dec.
1880	120.9	121.3	47.9	22.2	43.2	87.7
1881	105.1	76.0	21.5	19.0	49.3	51.1
1882	115.3	93.7	66.2	3.4	42.0	79.1
1883	140.5	116.5	131.1	13.0	77.9	110.3
1884	167.3	166.4	19.7	13.4	48.9	76.7
1885	227.6	115.4	58.1	3.8	40.7	107.7
1886	137.9	110.8	15.9	18.0	86.8	111.7
1887	233.2	146.6	79.3	7.0	111.2	131.9
1888	115.2	121.1	107.2	10.2	21.1	32.4
1889	65.1	101.5	13.8	0.0	33.0	98.0
Means	142.8	116.9	56.1	11.0	55.4	88.7

The manner of selecting the cold waves given in Table I was to examine all the a.m., temperature-change charts and ascertain such as had an area of 20° fall of more than 50,000 square miles. The weather maps of the day before were then looked up, in each case, and a sketch of its isobars and isotherms made on a small map of the United States about 4 by 2 inches in size. Sketches of the areas of temperature-fall were also made on similar small maps, alongside of the sketches of weather maps.

An examination shows that these temperature-fall areas are invariably associated with a considerable area of low or high barometric pressure on the weather map of the day preceding the fall. They occur to the west of the area of low pressure and to the east and southeast of a high area. The exceptions to this are very rare and where they do occur are unimportant as regards the extent of the area of temperature-fall. A case of this kind occurred in North Carolina on February 15, 1889, at 8 p. m. There was a fall of 18° at Charlotte and Raleigh, N. C., as compared with the temperature twenty-four hours previous which was 54°. There was an area of low pressure 900 miles to the west of the temperature-fall.

The greatest twenty-four-hour fall of temperature is usually at the center of low pressure or within 150 miles of it. It is more apt to be south or west of the center than north or east of it.

The low areas as a rule move to the northeast, east or north from some position in the west. The temperature-fall areas advance easterly or southeasterly on successive days. The temperature-fall area follows after the low area. At times it goes ahead of the low center towards the east while the low center moves north. This occurred for example on December 26, 1889.

The cases where there is a rise of temperature in twenty-four hours at the center of an area of low pressure are rare. All the weather maps for ten years, from October to April, 1880 to 1889, were examined for cases of this kind. Twenty-three such cases were found, which are given in Table V below.

TABLE V.—LOW-PRESSURE AREAS, WITH INCREASE OF TEMPERATURE IN TWENTY-FOUR HOURS AT THE CENTER.

[Date given is that of the map having the low area.]

Date.	Low pressure.	Place.	Temperature.	Change of temperature in twenty-four hours. Rise.	Fall.
Oct. 8, 1881	29.6	Moorhead, Minn	42	11	
Nov. 2, 1880	29.8	Des Moines, Iowa		1	
Nov. 5, 1881	29.6	Milwaukee, Wis	36	5	
Dec. 12, 1880	29.6	Chicago, Ill	32	1	
Dec. 29, 1880	29.7	Marquette, Mich	—12	8	
Feb. 10, 1880	29.9	Milwaukee, Wis	21	14	
		Chicago, Ill	34	6	
Mar. 4, 1881*	29.4	Chicago, Ill	20	6	
Mar. 5, 1881	29.7	Oswego, N. Y	31	10	
Mar. 15, 1882	29.9	Davenport, Iowa	32	8	
Nov. 9, 1882	30.0	do	50	6	
Mar. 30, 1885	29.8	Chicago, Ill	39	5	
		Milwaukee, Wis	35	4	
		Davenport, Iowa	36	7	
		Grand Haven, Mich	34	5	
Jan. 12, 1884	29.9	Chicago, Ill	22	15	
		Milwaukee, Wis	15	23	
		Grand Haven, Mich	21	27	
		Davenport, Iowa	21	16	
		Escanaba, Mich	4	14	
Feb. 2, 1884	30.0	Little Rock, Ark	44	6	
		Fort Smith, Ark	44	11	
Feb. 4, 1884	29.9	Little Rock, Ark	65	1	
Mar. 5, 1884	29.8	Fort Smith, Ark	37	5	
Oct. 1, 1885	29.8	do	67		2
Nov. 5, 1885	29.6	St. Louis, Mo	55	7	
		Cairo, Ill	59	1	
Nov. 21, 1885	29.5	Dodge City, Kans	44	3	
Oct. 13, 1888	29.7	Parkersburgh, W. Va	44	2	
		Pittsburgh, Pa	44	2	
		Columbus, Ohio	42	6	
Dec. 24, 1887	29.8	Alpena, Mich	20	6	
		Chicago, Ill	8	10	
Feb. 6, 1886	29.9	Marquette, Mich	14	12	
		Escanaba, Mich	10	4	
		Alpena, Mich	12	10	
Nov. 20, 1889	29.7	Erie, Pa	40	6	
		Cleveland, Ohio	40	6	
		Buffalo, N. Y	42	2	

* March 3 to 4 the center of this area of low moved from the southeast towards the northwest.

In these cases the temperature at the center of the low pressure is low for the time of the year as compared with the mean temperature. The extent of low pressure in these cases is apt to be small. In many cases it is really not a genuine area of low pressure, being a small circle surrounding a single observation of pressure which is somewhat lower than those at places round about it. Not more than twelve of these low areas given in Table V are of any importance in extent.

The total number of cold waves following low areas in ten years being about 621, while in only twelve cases during the same time were there any low areas of importance followed by a rise of temperature, it is concluded that in 98 per cent. of the cases an area of low pressure will be followed by a considerable fall of temperature.

All the cold waves that have occurred in ten years may be broadly classified as follows, having regard to the character of the isobars of the map on the day preceding the temperature fall:

(1) Low-pressure area with closed isobars and high-pressure area accompanying it. Cold waves may be of any extent from the greatest to the least.

(2) Low-pressure areas alone, without any accompanying high-pressure area. These are not usually followed by important cold waves unless the low area is of continental extent. With a center, of 29.3 inches of pressure and the distance across the 30-inch isobar at its widest being 1,600 miles, there would be likely to follow a great cold wave, but not so severe as if there was a high-pressure area accompanying it.

(3) High-pressure areas with very little low-pressure area accompanying them to the east or southeast. The low pressure is never entirely absent in the case of extensive high areas. The areas of temperature-fall in this variety of cold wave are very long; from south to north or southwest to northeast the length is from 1,000 to 1,600 miles and the width comparatively narrow in the direction at right angles to this, rarely being as much as 300 miles wide, even in the case of the most extensive areas of high pressure.

(4) A double **V**-shaped area of low pressure, one low area in the region of the Great Lakes open to the northeast, the other area in the vicinity of the Gulf of Mexico open to the southwest, with a very extensive area of high pressure to the northwest between the two. The cold waves of greatest extent have occurred with this type of map.

(5) A double low, one in the lake region and the other on the Atlantic Ocean, and a high area to the northwest. This is always followed by an extensive cold wave.

These different varieties may be still further divided, first according to the position of the high pressure with respect to the center of low pressure, and second according to the shape and position of the isobars in the low pressure.

The areas of temperature-fall have distinctive features depending on whether the area of high pressure is to the north, northwest, west, or southwest of the center of low pressure.

The isobars in the area of low pressure may be approximately circular and inclosed; they may be inclosed and elliptical in shape, with the long axis lying from southwest to northeast, which is the most common case, or lying from east to west, north to south, or northwest to southeast, the latter being being very unusual. These various shaped isobars may be open to any point of the compass. When the low is in the vicinity of the coast, the open appearance of isobars towards the ocean is due in some cases to the absence of observations.

The longer axis of the temperature-fall area is generally parallel to the longer axis of the area of low pressure on the map twenty-four hours preceding it. In the case of open isobars to the southwest, which is the most common of all open types, the long axis of temperature-fall area always lies from southwest to northeast. In case of open isobars toward the south the long axis of temperature-fall area invariably extends from north to south.

There is not such great variety in the shape of the isobars of a high area as in a low. They are most commonly of slight curvature, rarely inclosed, and open mostly towards the northwest or north. In some cases they are wedge-shaped, pointing south or southwest, and always in such cases are accompanied by high winds blowing in the direction in which the rounded ends of isobars point.

The isotherms in the region covered by the areas of high and low pressure where a cold wave is about to occur usually extend in a direction from southwest to northeast. There is not much variety in the position of the isotherms on maps preceding cold waves. In some cases they are slightly more inclined to the east than in others. To the west of the low center, for some distance, the isotherms usually run parallel to the long axis of the area of low pressure. At the center of low pressure the higher isotherms usually turn with a sharp curvature and extend towards the southeast; the medium-temperature isotherms bend less and extend towards the east; the lower ones continue towards the northeast.

South of centers of high pressure the isotherms turn to the northwest. From the turns made by these lines it is natural to supppose they are carried into position by the high and low areas of pressure, from what may be called a normal position running a little north of east, the low area of pressure being mainly a current of air from the south and the high area a current from the north.

The density or closeness of the isothermal lines varies widely on the maps preceding cold waves. The decrease of temperature may be anywhere from 20° to 80° in a northwesterly direction in a distance of 500 miles from the center of a low pressure. The area marked by strongly diminishing temperature towards the northwest may vary a great deal in width, sometimes not being more than 200 miles in a northwesterly direction and sometimes being as great as 1,600. The dimensions of the area from southwest to northeast also vary greatly. Usually the greatest contrast of temperature or temperature gradient, as it will be called, is to be found in a direction from the center of the low or its vicinity, extending towards the north or northwest. To the northeast and southwest of this direction of heaviest temperature gradient the gradients usually diminish. In some cases a uniformly heavy temperature gradient towards the west or northwest will extend for 1,000 miles or more over a stretch of country extending in a direction from southwest to northeast. These are the cases invariably followed by extensive and severe cold waves when highs and lows accompany them.

The map of December 31, 1884, and temperature-change chart of January 1, 1885, at the end of the text of appendix, is a good specimen of a high and low area of pressure, with a region covered by strongly diminishing temperature to the southwest and followed by an extensive and severe cold wave.

The first idea that occured to the writer with regard to forecasting the occurrence of cold waves was to find similar weather maps. It was imagined that it might be possible to make such a catalogue of all the weather-maps on the day preceding the occurence of cold waves that one could find among the maps of past years some one identical or nearly so, as to their isobars and isotherms with maps as they arise for consideration from day to day in the forecasting of cold waves. In such cases the temperature-falls that would take place might be considered the same as those that had occurred after the similar map in times past. Thus the forecasting of cold waves might be rendered a very simple matter. But the plan did not prove feasible. Similar or nearly similar maps are very scarce. A list of the maps preceding cold waves, which were found to be somewhat nearly alike, is given below. They are not, however, closely similar.

Maps with similar isobars and isotherms.

October 31, 1883.	November 17, 1887.
February 11, 1881.	November 12, 1886.
December 31, 1886.	February 3, 1886.
January 17, 1885.	January 21, 1883.
February 29, 1888.	January 4, 1888.
March 12, 1888.	November 26, 1888.
November 8, 1888.	December 20, 1881.
December 4, 1885.	December 20, 1887.
November 26, 1887.	February 19, 1890.

Only one opportunity was presented in the course of two years in which this principle was available for forecasting cold waves. On that particular occasion, however, the forecast proved highly successful. The weather-map of February 19, 1890, was recognized as being similar to the map of November 26, 1887. Accordingly, the outline of the 20° temperature-fall area of November 27, 1887, was adopted as the temperature-fall area of February 20, 1890.

The results were as follows:

COMPARISON OF THE SIMILAR COLD WAVES OF NOVEMBER 27, 1887, AND FEBRUARY 20, 1890.

Locality.	November 26, 1887.			February 19, 1890.		
	Observed temperature.	Fall of temperature in 24 hours.	Temperature after fall.	Observed temperature.	Fall of temperature in 24 hours.	Temperature after fall.
	°	°	°	°	°	°
Duluth	26	—34	— 8	12	—24	—12
St. Paul	20	—30	—10	14	—24	—10
La Crosse	24	—22	2	20	—20	0
Davenport	34	—30	4	28	—20	8
Keokuk	34	—24	10	32	—24	8
St. Louis	44	—24	20	40	—22	18
Cairo	60	—22	38	42	—16	26
Memphis	64	—16	48	64	—24	40
Little Rock	54	—18	36	66	—28	38

COMPARISON OF THE SIMILAR COLD WAVES, ETC.—Continued.

Locality.	November 26, 1887.			February 19, 1890.		
	Observed temperature.	Fall of temperature in 24 hours.	Temperature after fall.	Observed temperature.	Fall of temperature in 24 hours.	Temperature after fall.
	°	°	°	°	°	°
Shreveport*	64	—24	40	66	—26	40
Palestine	64	—36	28	66	—12	54
San Antonio	58	—20	38	66	0	66
Abilene	50	—34	16	66	34	32
Fort Davis	54	—26	28			
El Paso	48	—18	30	58	—14	44
Fort Sill	42	—32	10	44	—22	22
Fort Elliott	38	—42	— 4	40	—20	20
Fort Smith	50	—30	20	48	—16	32
Lamar	42	—36	6	46	—30	16
Kansas City	34	—38	— 4	32	—24	8
Concordia	32	—42	—10	24	—22	2
Dodge City	30	—40	—10	28	—18	10
Pueblo	26	—40	—14	40	—20	20
Denver	8	—18	—10	26	— 4	22
Des Moines	30	—36	— 6	26	—30	— 4
North Platte	4	—28	—24	12		
Omaha	30	—40	—10	20	—28	— 8
Yankton	16	—31	—15	14	—24	—10
Valentine	2	—28	—30	— 2	—10	—12
Huron	4	—30	—26	— 6	—10	—16
Fort Sully	2	—22	—24	— 8	—10	—18
Moorhead	2	—18	—20	—10	— 8	—18
Bismarck	8	—14	—22	—20	— 4	—24

* Fall of temperature on 21st was 26°.

On further investigation it seems that identical weather-maps need not necessarily be followed by similar falls in temperature. The quite similar maps of December 4, 1885, and December 20, 1887, type XLIII, except as to the slight difference in position of the centers of low pressure and openness of the isobars of low was followed in the first case by a cold wave of the extent of 24.1, while in the other the extent of cold wave was only 9.2.

It need not necessarily be the case that two similar maps will be followed by like falls of temperature. With exactly similar temperatures at the ground on two different days, the diminution of temperature upward in the air may be very different on the two occasions. This is the only satisfactory explanation of the dissimilarities in temperature-fall following similar conditions on the weather maps. The Signal Service weather-maps have nothing that shows the temperature of the air in the higher regions.

The low areas of pressure mostly originate in the southwest and move toward the northeast. At times they form in the west or northwest and after moving southeast then turn and move northeast. If two similar maps could be found, the one occurring after a low area has advanced to the southeast and one on some other occasion after the low has moved from the southwest towards the northeast and reached the same position as in the first case, it is conceivable that the upward diminution of temperature in the air might be very different in the two cases, and consequently the falls of temperature following them be very different.

As it was considered that a classification of weather-maps preceding cold waves made with a view to discovering similar ones, might prove useful in the practical work of forecasting cold-waves, this was done.

Table VI gives the results of the classification of all the weather maps preceding cold waves that have occurred in ten years. The table is preceded by a description of the various types of maps intended to be of service in discovering maps similar to those that may arise from day to day in the practical work of forecasting. A specimen of each type is given. The red lines are the isobars, the dotted blue lines the isotherms.

The temperature-fall areas (not reproduced) are shown by green lines. A short description of the type of weather map preceding cold waves is given. The latitude and longitude of the center of low pressure is given, the lowest and highest pressure and their distance apart, in miles, the direction of high pressure from low center, the highest and lowest isotherm and their least distance apart. The classification is made to depend principally on the geographical position of the center of the area of low pressure. No definite district boundaries have been adopted. The type is described roughly by the place its center happens to be in, as, for instance, Arizona, Texas, New England, etc. The districts are taken with an area of about 250,000 square miles. The Missouri type includes not only those with centers in the State of Missouri, but also those in parts round about it for some distance. The type is also described with reference to the relative positions of the high and low centers, and with reference to the shape of the area of low pressure, and the openness of its isobars, etc. The object of the classification is not only to discover among back maps ones similar to such as may arise in the future, but also to ascertain what characteristic features they may have, if any, which may be of service in indicating the shape, position, or extent of the subsequently occurring area of temperature fall. These weather maps with their temperature-fall areas have been arranged all of the same type together.

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, OCTOBER TO MARCH, 1880 TO 1889, INCLUSIVE.

[I.—Arizona low; high to north or northeast. Type January 14, 1888. Number of cases 6.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
	In.	°	°	*In.*		*Miles.*	° °	*Miles.*
Oct. 7, 1887	29.3	35	110	30.1	NW.	1,000	30 to 70 N.	700
Jan. 14, 1888	29.8	35	107	30.9	N.	1,100	—40 70 N.	1,200
Mar. 1, 1888	29.7	34	106	30.6	NE.	700	—10 50 N.	600
Mar. 25, 1888	29.5	39	107	30.5	NE.	700	—10 50 NE.	800
Jan. 19, 1889	29.9	36	105	30.5	NW.	600	—10 60 N.	1,600
Feb. 15, 1889	29.5	33	105	30.4	N.	900	0 60 N.	1,100

[II.—Utah low; isobars circular. Type November 25, 1887. Number of cases 3.]

Nov. 25, 1887	29.6	40	112	30.3	N.	700	0 to 30 NE.	300
Nov. 21, 1886	29.4	42	112	30.0	N.	500	0 30 NE.	200
Dec. 28, 1889	29.4	39	104	30.3	NW.	800	20 50 N.	700

[III.—Idaho low; comet-shaped (see also Type LXV, January 21, 1886). Type December 26, 1887. Number of cases 5.]

Dec. 25, 1883	29.5	51	111	30.3	SW.	600	—20 to 30	------
Dec. 22, 1886	29.8	46	114	------	------	------	—10 30 E.	700
Jan. 24, 1887	29.6	44	106	------	------	------	—20 30 NE.	500
Dec. 26, 1887	29.4	------	------	30.1	NE.	600	—20 20 N.	400
Mar. 8, 1888	29.6	41	112	30.2	------	------	0 40 NE.	400

[IV.—Colorado low; comet-shaped; northwest to southeast; flat and narrow; long west to east; high to north and northeast; important type. Type February 10, 1887. Number of cases 5.]

Dec. 21, 1884	29.6	42	104	30.2	NE.	500	—30 to 60 N.	1,400
Dec. 23, 1884	29.9	------	------	30.4	NE.	300	—40 40 NE.	600
Feb. 10, 1887	29.6	------	------	30.4	NE.	500	—30 50 N.	800
Jan. 4, 1888	29.5	40	108	30.5	N.	400	—10 40 N.	500
Feb. 13, 1888	29.6	43	103	30.0	N.	400	—10 40 N.	500

January 4, 1888, and February 13, 1888, are alike.

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[V.—Colorado low; triangular flat top, peak pointing south; high to the north. Type March 9, 1888. Number of cases, 6.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
	In.	°	°	*In.*		*Miles.*	° °	*Miles.*
Dec. 20, 1884	29.8	-----	-----	30.1	N.	300	—30 to 40 N.	900
Nov. 22, 1886	29.4	43	105	30.2	N.	400	0 60 N.	500
Jan. 31, 1887	29.6	37	102	30.5	N.	700	—30 50 N.	1,200
Feb. 2, 1887	29.6	38	108	30.7	N.	300	—40 30 N.	400
Mar. 9, 1888	29.6	37	101	30.4	N.	700	—20 40 N.	600
Mar. 14, 1889	29.5	41	103	30.4	NE.	900	0 50 N.	500

[VI.—Colorado low; long, narrow, northeast to southwest; high to the east. Type October 19, 1886. Number of cases, 7.]

Feb. 18, 1882	29.9	-----	-----	-----	--------	--------	0 to 60 N.	800
Mar. 26, 1882	29.6	37	100	30.2	--------	--------	20 50 N.	400
Dec. 6, 1883	29.7	39	102	30.1	NW.	1,000	--------	
Oct. 19, 1886	29.5	40	102	30.1	NW.	900	30 60 NW.	600
Nov. 1, 1886	29.7	37	104	30.2	NW.	700	30 50 NW.	400
Oct. 22, 1887	29.7	40	106	30.2	NW.	700	20 40 NE.	500
Jan. 12, 1888	29.5	38	103	30.3	--------	--------	—30 30 N.	1,000

[VII.—Colorado low; big, triangular in shape; high northeast and east. Type March 24, 1888. Number of cases, 2.]

Dec. 3, 1887	29.7	39	101	30.3	NE.	--------	0 to 60 NW.	1,200
Mar. 24, 1888	29.6	38	105	30.6	NE.	700	—10 10 N.	500

[VIII.—Texas low; high to north, like VII., only farther south. Type November 26, 1887. Number of cases, 2.]

Nov. 26, 1887	29.8	33	102	30.9	N.	1,000	—30 to 60 N.	1,100
Dec. 27, 1887	29.6	33	101	30.4	N.	1,000	—20 30 NW.	400

[IX.—Texas low; triangular shaped; pointed northeast, high northwest. Type November 11, 1889. Number of cases, 5.]

Nov. 4, 1880	29.5	36	101	30.3	N.	700	30 to 60 NW.	700
Feb. 17, 1881	29.8	30	102	30.3	N.	900	—20 60 N.	1,200
Jan. 22, 1887	29.5	35	99	30.2	N.	1,600	—30 60 N.	900
Mar. 19, 1888	29.2	34	101	30.3	NW.	1,000	10 50 NW.	600
Nov. 11, 1889	29.6	35	98	30.4	N.	900	0 50 N.	700

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[X.—Texas low towards northeast, long and narrow; rounded point northeast. Type February 12, 1884. Number of cases, 10.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
	In.	°	°	In.		Miles.	°	°	Miles.
Nov. 9, 1880	29.7	32	100	30.0	NW.	700	30 to	70 NW.	800
Nov. 16, 1882	30.1	40	92	30.5	NW.	700	20	40 NW.	500
Feb. 3, 1883	29.9	------	------	30.8	NW.	600	—10	60 NW.	1,200
Dec. 30, 1883	29.9	26	97	30.5	N.	600	—20	50 NW.	100
Feb. 12, 1884	29.9	33	95	30.6	N.	800	—20	60 N.	900
Nov. 22, 1884	29.7	35	96	30.4	NW.	600	0	40 N.	500
Dec. 17, 1884	30.1	------	------	30.4	NW.	400	—30	60 N.	1,400
Mar. 28, 1885	29.8	27	97	30.4	N.	1,600	—10	60 N.	1,300
Jan. 2, 1886	29.7	28	97	30.3	N.	1,000	0	60 NW.	1,000
Feb. 23, 1887	29.9	35	98	30.4	N.	600	—20	60 NW.	1,000

[XI.—Texas low; rounded point towards northeast; same as X only low farther west; isobars more crowded and nearer coast. Type November 16, 1886. Number of cases, 4.]

Feb. 20, 1882	29.8	34	95	30.3	N.	800	—30 to	60 NW.	900
Nov. 11, 1886	30.0	32	96	30.4	N.	400	20	70 NW.	600
Nov. 16, 1886	29.8	31	100	30.6	N.	400	20	60 NW.	700
Nov. 23, 1887	30.1	33	95	30.5	N.	100	0	50 NW.	700

[XII.—Texas low; high to north; same as VIII only the low is more extensive. Type October 8, 1887. Number of cases, 3.]

Jan. 16, 1881	29.8	33	97	30.1	N.	600	—10 to	50 N.	1,000
Jan. 18, 1883	29.9	36	103	30.6	N.	700	—30	30 NW.	1,000
Oct. 8, 1887	29.6	33	102	30.1	N.	500	40	70 NW.	500

[XIII.—Texas and towards west low; same as XII, except that low is more extensive. Type March 29, 1886. Number of cases, 5.]

Jan. 15, 1885	30.0	------	------	30.7	N.	1,300	—20 to	50 N.	1,300
Mar. 21, 1885	29.8	29	95	30.5	N.	1,300	—20	50 N.	1,200
Mar. 29, 1886	29.9	------	------	30.2	N.	400	0	70 NW.	900
Jan. 15, 1886	------	------	------	30.5	N.	------	—10	50	------
Mar. 27, 1886	29.9	------	------	30.7	N.	1,000	—10	50 N.	1,300

[XIV.—Texas low; flat east to west on coast; high to the north. Type January 9, 1881. Number of cases, 9.]

Mar. 13, 1880	30.1	------	------	30.6	------	------	—20 to	50 NW.	1,200
Nov. 17, 1880	30.1	28	94	30.7	N.	500	—10	50 NW.	900
Jan. 9, 1881	29.9	------	------	30.6	N.	900	—40	40 N.	1,400
Feb. 27, 1884	29.8	28	97	30.7	N.	1,500	—30	60 N.	1,400
Dec. 12, 1885	30.0	27	97	30.7	NE.	1,200	0	60 N.	600
Jan. 7, 1886	29.8	28	97	30.8	N.	1,200	—30	50 N.	1,300
Feb. 2, 1886	29.8	27	97	30.8	N.	1,500	—40	60 N.	1,500
Dec. 31, 1886	29.8	------	------	30.8	NW.	1,000	—30	60 NW.	1,600
Jan. 26, 1889	29.9	30	92	30.6	N.	800	10	50 N.	800

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[XV.—Texas low; very extensive, reaching lakes; high northwest. Type December 19, 1887. Number of cases, 6.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
	In.	°	°	*In.*		*Miles.*	°	°	*Miles.*
Mar. 7, 1880	29.9	33	97	30.8	N.	1,200	−10 to	70 N.	1,200
Jan, 19, 1883	29.9	27	97	30.8	N.	1,500	−30	20 NW.	......
Dec. 30, 1884	30.0	......	......	30.8	NW.	......	−40	60 NW.	1,100
Dec. 29, 1885	29.8	37	102	30.3	......	......	......	......	......
Dec. 23, 1886	29.9	34	101	30.2	NW.	300	20	60 NW.	500
Dec. 19, 1887	29.7	34	102	30.8	NW.	1,000	−20	30 NW.	500

[XVI.—Double low; Texas or vicinity to lake region; also Utah to lake region; northeast to southwest. Type January 16, 1882. Number of cases, 13.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
Mar. 11, 1880	30.0	44	88	30.4	NW.	400	−10 to	30 NW.	500
Nov. 18, 1881	29.9	33	99	30.6	NW.	900	−10	70 NW.	1,200
Jan. 16, 1882	29.6 29.9	......	......	30.5	......	......	−20	60 N.	1,000
Mar. 12, 1882	......	......	......	30.2	......	......	10	50 N.	700
Jan. 23, 1884	29.9 29.9	......	......	30.8	......	......	−30	30 NW.	800
Feb. 6, 1884	29.8 29.8	......	......	30.5	NW.	800	−30	60 NW.	1,200
Oct. 20, 1884	......	......	......	30.4	......	......	30	60 NW.	400
Dec. 24, 1884	30.1 29.8	43	83	30.8	NW.	900	−40	60 NW.	1,300
Feb. 8, 1885	29.8 29.8	......	......	30.3 30.3	NW. N.	1,000 1,100	−40	60 N.	1,300
Jan. 7, 1888	29.8 29.9	......	......	30.6	W.	1,300	−20 0	60 NW. 70 NW.	1,200 600
Feb. 14, 1888	30.0 30.0	......	......	30.9	N.	800	−30	30 NW.	1,100
Feb. 17, 1889	29.6 29.8	......	......	30.3	......	......	−20	60 NW.	1,200
Feb. 22, 1889	30.0	......	......	31.1	......	......	−38	30 NW.	800

[XVII.—Double low; Texas to lakes or Georgia to lakes; north to south; something like XVI. Type February 16, 1883. Number of cases, 18.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
Nov. 5, 1880	29.8 29.9	......	......	30.3	N.	800	−30 to	60 NW.	900
Dec. 5, 1880	29.2	45	85	30.1	SW.	300	0	60 NW.	500
Nov. 8, 1881	29.8	......	......	30.2	NW. SW.	700 400	30	70 NW.	700
Nov. 23, 1881	29.9	......	......	31.0	W. NW.	1,000 1,600	10	60 NW.	1,100
Dec. 14, 1881	29.7	47	72	30.5	SW.	1,100	10	60 NW.	1,100
Feb. 8, 1882	29.8	......	......	30.4	W.	800	0	50 NW.	600
Nov. 12, 1882	29.8 30.0	......	......	30.3	SW. NW.	500 500	0	70 NW.	900
Jan. 20, 1883	30.0 30.1	......	......	30.3	......	......	−40	40 NW.	1,000
Feb. 16, 1883	29.6 29.8	......	......	30.5	W.	500	0	60 NW.	300
Dec. 13, 1883	29.6 30.1	......	......	30.5	W.	......	......	......	......

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[XVII.—Double low; Texas to lakes or Georgia to lakes; north to south; something like XVI. Type February 16, 1883. Number of cases, 18. Continued.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
	In.	°	°	*In.*		*Miles.*	°	°	*Miles.*
Jan. 11, 1884	29.8			30.6	SW.		20	60	
Feb. 5, 1884	29.6	44	85	30.2	NW.	700	0	60 NW.	800
Nov. 27, 1884	29.8 29.9			30.4 30.4	W. NW.	650 1,000	10	60 N.	1,200
Dec. 11, 1884	29.8 29.7	27	96	30.4	N.	1,200	10	70 N.	1,100
Dec. 8, 1885	29.9 29.5			30.4	NW.	1,600	—20	60 N.	1,000
Jan. 22, 1886	29.9 29.9			30.6	W.	600	—30	30 NW.	500
Jan. 1, 1888	29.2	46	89	30.1	SW.	600	—30	50 NW.	1,000
Feb. 4, 1888	29.7 29.8			30.4	W.		0	30 N.	400
Mar. 11, 1888	29.7 29.9			30.7 30.7	SW. W.	800	—20	60 NW.	1,500
Dec. 25, 1888	29.9			30.4 30.4	NW. N.	1,000 1,100	0	60 N.	1,100

[XVIII.—Manitoba low; very wide east and west; high to south. Type January 17, 1884. Number of cases, 23.]

Jan. 3, 1880	29.4	50	97						
Jan. 18, 1880	29.7						10 to 50 NW.		1,100
Jan. 25, 1880	29.6						20	40 NE.	
Dec. 13, 1880	29.6	47	99						
Jan. 20, 1882	29.7			30.2	SW.		10	30 N.	500
Jan. 25, 1882	29.6						10	40 NW.	400
Feb. 15, 1882	29.8								
Jan. 9, 1883	29.5			30.6	NW.	800	—10	40 E.	400
Feb. 6, 1883	29.8								
Mar. 17, 1883	29.2								
Oct. 29, 1883	29.4			30.2	SW.		40	70 NW.	500
Jan. 17, 1884	29.6			30.4 30.5	SW. SE.	600 900			
Jan. 8, 1885	29.3			30.3	S.	1,300			
Mar. 23, 1885	29.8			30.4	S.	500			
Dec. 22, 1885	29.7	48	97	30.2	SW.	800			
Jan. 11, 1887	29.3			30.2					
Jan. 15, 1887	29.7			30.2			—10	50.	
Mar. 1, 1887	29.6			30.4	S.	1,300			
Mar. 23, 1887	29.7								
Nov. 18, 1887	29.5	51	99	30.5	SW.	700			
Nov. 21, 1887	29.6			30.2	S.				
Dec. 8, 1887	29.7	48	105	30.2	SW.	700			
Mar. 12, 1889	29.9			30.2					

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[XIX.—Manitoba low; long north and south, open north. Type November 25, 1883. Number of cases, 18.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
	In.	°	°	In.		Miles.	°	°	Miles.
Jan. 5, 1880	29.7								
Feb. 16, 1880	29.7						−20 to	50 NW.	400
Dec. 1, 1880	29.3	50	97						
Jan. 29, 1881	29.9						−10	30	
Feb. 25, 1881	29.7						10	30 NE.	300
Feb. 12, 1882	29.7	47	94				30	60	
Mar. 17, 1882	29.6	44	100						
Dec. 11, 1882	29.7	49	107				0	50 NE.	
Nov. 25, 1883	29.5	50	96	30.0	W.	400	−20	60 NW.	1,000
Feb. 24, 1886	29.6	50	97	30.3	W.	1,000	0	40 S.	400
Mar. 7, 1886	29.8	49	93	30.3	SW.	1,300			
Dec. 20, 1886	29.6	50	92	30.3	W.	1,300			
Mar. 6, 1887	29.3	51	96	30.2	SW.				
Dec. 25, 1887	29.8			30.1	NW.	400			
Feb. 24, 1888	29.8	48	96	30.6	W.	1,100	10	30 N.	300
Mar. 14, 1888	29.8	51	100	30.6	E.	300	0	30 NE.	600
Dec. 2, 1888	29.9	49	95	30.3	W.	500	10	40 NE.	300
Mar. 18, 1888	29.4	47	97	30.2	W.		10	40 E.	600

[XX.—Dakota low; northeast and southwest. Type February 11, 1880. Number of cases, 12.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
Feb. 11, 1880	29.3	48	97				20 to	60 N.	1,000
Mar. 3, 1880	29.5	43	94				0	50 NW.	400
Oct. 14, 1880	29.2	47	92				40	60 NW.	500
Jan. 5, 1881	29.6	42	95	30.1	NW.	500	10	20.	
Jan. 12, 1881	29.7	43	94	30.3	SW.		−10	30 N.	600
Feb. 26, 1881	29.5	43	94				20	60 N.	800
Nov. 16, 1881	30.0	43	102				10	50 N.	700
Oct. 15, 1882	29.6	45	99	30.1			30	60 NW.	400
Oct. 30, 1882	29.5	43	93				30	60 NW.	400
Nov. 10, 1882	29.8	45	94				10	60 NW.	1,000
Dec. 23, 1888	29.9	47	104	30.2	NW.	300	−10	20 NW.	

[XXI.—Dakota or Minnesota low; long north to south; inclosed. Type January 12, 1883. Number of cases, 17.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
Jan. 26, 1880	29.4	48	93	30.2	E.		0 to	40 NW.	500
Mar. 6, 1880	29.8						20	60 N.	600
Dec. 12, 1881	29.9			30.0			10	60 NW.	600
Feb. 6, 1882	29.8	45	98				20	40.	
Dec. 12, 1882	29.2	45	95	30.1			0	50 NW.	1,000
Jan. 12, 1883	29.5	45	98	30.3	W.	1,000	−20	20 NE.	
Oct. 8, 1883	29.6	48	95	30.3	W.	1,200	40	70 NW.	300
Dec. 17, 1883	29.4	46	99	30.3	W.	900	−10	40 NE.	700
Nov. 11, 1885	29.6	43	96	30.3	NW.	1,000	30	50 NW.	
		40 and 50 close; 30 and 60 far off.							
Nov. 30, 1886	29.7	44	101	30.2	SW.	300	0	50 NE.	700
Mar. 8, 1887	29.8			30.3			10	40.	
Mar. 12, 1887	29.8	47	96	30.2	W.	500			
Feb. 6, 1888	29.8	44	99	30.2	W.	700	−30	30 N.	600
Jan. 30, 1889	29.8	48	92	30.4	W.	600	10	30.	
Dec. 8, 1889	29.4	47	92	30.0	NW.	600	0	40 NW.	800
Dec. 18, 1889	29.6	48	96	30.1	W.	800	10	40 NW.	700
Dec. 24, 1889	29.8	45	93	30.4	NW.	600	−10	50 NW.	700

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[XXII.—Minnesota low; inclosed; something like XXI. Type February 4, 1889. Number of cases, 8.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
	In.	°	°	In.		Miles.	°	°	Miles.
Jan. 30, 1883	29.5	45	92	30.3	NW.	500	10 to	40 N.	400
Nov. 5, 1883	29.6	47	90	30.2	W.	500	20	60 NW.	600
Mar. 11, 1884	29.1	44	92	30.0	NW.	1,000	—20	60 NW.	1,200
Mar. 14, 1885	29.5	46	92	30.4	W.	700	----	----	----
Feb. 18, 1886	29.6	47	92	30.4	NW.	1,100	0	40 N.	600
Dec. 23, 1887	29.6	46	92	30.5	W.	----	----	----	----
Feb. 4, 1889	29.2	45	94	30.4	W.	700	—10	40 N.	300
Jan. 16, 1889	29.3	45	95	30.1	NW.	700	0	50 NW.	700

[XXIII.—Double low; Dakota and Michigan. Type March 20, 1888. Number of cases, 2.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
Mar. 9, 1887	29.9	43	84	30.1	NW.	----	10 to	40 NW.	400
Mar. 20, 1888	29.5 29.4	47 45	98 83	30.3	W.	1,100	0	50 NW.	900

[XXIV.—Wyoming and Dakota; low extensive. Type February 15, 1883. Number of cases, 10]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
Feb. 6, 1880	30.0	44	95	----	----	----	—20 to	30 N.	500
Feb. 26, 1880	29.6	45	97	----	----	----	—10	50 N.	800
Jan. 27, 1882	30.0	----	----	----	----	----	—20	60 N.	1,100
Feb. 15, 1883	29.7	----	----	30.1	----	----	—10	30 N.	400
Feb. 18, 1884	29.4	45	99	----	----	----	—20	30 NW.	800
Jan. 31, 1885	30.0	44	99	30.2	N.	300	0	20	----
Feb. 6, 1885	29.8	44	99	----	----	----	—30	30 NE.	500
Jan. 19, 1887	29.2	45	112	29.9	----	----	—20	60 NE.	600
Dec. 18, 1887	29.6	45	95	----	----	----	10	30 N.	300
Nov. 1, 1888	29.7	44	101	----	----	----	30	60 N.	500

[XXV.—Minnesota or Lake Superior low; open northwest; high southwest or south in Texas. Type October 16, 1880. Number of cases, 3.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
Oct. 16, 1880	28.9	45	92	30.2	S.	----	30 to	60 W.	600
Oct. 17, 1880	29.2	45	87	30.3	SW.	900	30	70 NW.	900
Feb. 10, 1881	29.4	47	86	----	----	----	10	50 W.	900

[XXVI.—Missouri to Colorado low; rounded northeast; high northwest. Type November 22, 1887. Number of cases, 8.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
Feb. 27, 1880	29.8	----	----	30.7	N.	400	—20 to	50 N.	900
Mar. 4, 1880	29.5	40	96	----	----	----	—10	60 N.	800
Oct. 15, 1880	29.6	39	97	30.2	NW.	----	30	70 NW.	800
Dec. 4, 1880	29.6	38	96	----	----	----	—10	60 N.	900
Mar. 2, 1881	29.6	40	96	----	----	----	10	50 NE.	800
Feb. 7, 1885	29.6	39	96	----	----	----	—20	50 N.	1,100
Feb. 17, 1887	29.2	40	98	----	----	----	0	60 N.	1,000
Nov. 22, 1887	29.6	38	100	30.3	NW.	1,000	10	50 NW.	800

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[XXVII.—Missouri low; open southwest, like XXVI, only rounded end more to the north than the northeast; high north, and in some cases northwest. Type December 31, 1887. Number of cases, 17.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
	In.	°	°	*In.*		*Miles.*	°	°	*Miles.*
Jan. 27, 1880	29.7	37	97	30.1			—20 to	40 NW.	1,000
Dec. 20, 1881	30.0	36	94	30.8	NW.	800	20	60 NW.	400
Mar. 4, 1882	29.7	41	95	30.4	NW.	900	10	50 NW.	800
Mar. 20, 1882	29.6	43	96	30.3	NW.	600	0	60 NW.	700
Feb. 24, 1883	29.7	37	95	30.4	NW.	600	0	50 N.	900
Dec. 29, 1883	29.9	41	93	30.4	NW.	500	—20	40 NW.	700
Mar. 12, 1885	29.8	37	93	30.5	N.	800	—20	50 N.	700
Nov. 6, 1885	29.4	39	95	30.0	W.	700	30	70 NW.	400
Nov. 22, 1885	29.6	38	90	30.2	NW.	900	20	50 N.	800
Feb. 9, 1886	29.5	40	94	30.4	N.	600	0	40 NW.	600
Mar. 19, 1886	29.6	41	93				20	60 N.	700
Nov. 17, 1886	29.4	43	94	30.4	W.	600	0	50 NW.	600
Mar. 27, 1887	29.8	37	93	30.4	N.	500	10	60 N.	800
Oct. 24, 1887	29.6	41	90	30.6	NW.	900	10	60 NW.	1,000
Dec. 30, 1887	29.5	42	94	30.3	NW.	700	—10	40 NW.	600
Mar. 26, 1888	29.6	40	87	30.5	NW.	1,000	0	60 NW.	1,100
Nov. 8, 1888	29.6	34	93	30.5	NW.	900	20	60 NW.	800

[XXVIII.—Missouri low; open northeast and southwest; high northwest. Type January 10, 1884. Number of cases, 6.]

Oct. 3, 1880	29.9	43	82	30.3	NW.	600	30 to	60 NW.	800
Nov. 30, 1881	29.9	40	93	30.2	NW.	300	0	60 N.	800
Dec. 13, 1881	29.7	42	89	30.5	NW.	900	—10	60 N.	700
Jan. 10, 1884	29.7	39	91	30.5	NW.	800	—10	40 N.	1,000
Oct. 7, 1884	29.9	40	96	30.3	NW.	400	20	70 NW.	600
Oct. 18, 1888	29.7	43	97	30.3	NW.	500	30	60 N.	600

[XXIX.—Missouri low; open northeast; high northwest. Type January 11, 1885. Number of cases, 12.]

Jan. 19, 1880	29.7	40	96	30.2	N.	500	—20 to	50 N.	600
Jan. 26, 1882	29.6	43	95	30.1	NW.	500	—10	60 NW.	900
Feb. 16, 1882	29.9	40	92	30.6	NW.	600	—10	60 NW.	1,000
Dec. 16, 1883	29.7	41	91	30.5	NW.	900	—20	30 N.	500
Jan. 11, 1885	29.5	39	97	30.2 29.6	NW.	600	—10	40 NW.	700
Feb. 14, 1885	29.7	38	99				—20	20 N.	600
Feb. 17, 1885	29.8	38	95	30.3	NW.	700	30	30 N.	1,000
Nov. 16, 1887	29.7	43	90	30.3	W.	1,000	20	50 NW.	700
Nov. 9, 1888	29.7	38	90	30.4	NW.	700	20	60 NW.	500
Dec. 15, 1888	29.5	40	97				20	50 NW.	500
Jan. 8, 1889	29.6	35	95	30.3	NW.	800	0	50 NW.	1,000
Dec. 10, 1889	29.7	42	94	30.1	NW.		10	50 NW.	1,000

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[XXX. Missouri low; oblong northeast to southwest; inclosed; high northwest. Type February 19, 1888. Number of cases, 8.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
	In.	°	°	In.		Miles.	°	°	Miles.
Dec. 26, 1883	29.5	42	93	30.3	NW.	600	—30 to	50 N.	700
Jan. 27, 1885	29.9	37	93	30.3	N.	400	—30	30 N.	700
Dec. 12, 1886	29.8	39	95	30.5	W.	800	10	40 NW.	400
Jan. 16, 1887	29.6	39	95	30.2	NW.	700	—20	50 N.	800
Feb. 19, 1888	29.5	40	95	30.4	NW.	1,100	10	50 N.	1,000
Nov. 5, 1888	29.7	38	96	30.3	NW.	1,300	20	60 NW.	1,000
Mar. 15, 1889	29.6	40	94	30.2	N.	500	0	50 N.	500
Dec. 16, 1889	29.9	42	93	30.4	NW.	800	20	60 NW.	700

[XXXI.—Missouri to lakes low; flat and narrow; peaked southwest; open northeast. Type March 18, 1883. Number of cases, 5.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
Mar. 18, 1883	29.5	39	89	30.4	NW.	700	—20 to	50 N.	600
Jan. 18, 1884	29.5	48	69	30.6	----	----	—20	30 NW.	500
Mar. 2, 1887	29.6	45	81	30.4	NW.	700	—10	60 N.	800
Jan. 19, 1888	30.2	----	----	30.7 30.5	NW. SE.	400 300	—40	10 N.	800
Dec. 24, 1888	29.8	----	----	30.3	NW.	500	0	50 N.	300

[XXXII.—Mississippi Valley low; long, open south. Type January 3, 1886. Number of cases, 10.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
Feb. 12, 1881	29.7	35	90	30.4	NW.	900	—10 to	50 NW.	1,100
Dec. 21, 1881	30.0	39	92	30.4	NE.	400	20	60 NW.	500
Jan. 17, 1883	29.8	43	87	30.5	NW.	700	—20	40 NW.	900
Feb. 15, 1885	29.7	38	89	30.2	NW.	700	—20	30 NW.	800
Oct. 19, 1885	29.6	40	92	30.3	NW.	700	30	60 NW.	600
Dec. 13, 1885	29.9	37	87	30.5	NW.	1,000	10	40 NW.	700
Jan. 3, 1886	29.7	40	92	30.2	NW.	500	—10	50 NW.	600
Mar. 30, 1886	29.7	30	87	30.1	NW.	600	10	60 NW.	800
Jan. 20, 1889	30.0	36	90	30.6	W.	900	—20	50 NW.	600
Nov. 12, 1889	29.8	29	91	30.2	NW.	600	0	60 NW.	800

[XXXIII.—Mississippi low; high northwest. Type February 3, 1886. Number of cases, 6.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
Dec. 19, 1883	30.0	33	87	30.4	N.	400	20 to	60 NW.	400
Nov. 28, 1884	29.7	32	87	30.3	NW.	900	30	60	----
Jan. 8, 1886	29.5	32	87	30.9	NW.	1,500	—40	40 NW.	1,300
Feb. 3, 1886	29.8	32	87	30.9	NW.	1,400	—40	50 NW.	1,400
Mar. 9, 1886	29.8	30	87	30.4	NW.	1,000	—10	50 NW.	900
Dec. 24, 1887	29.6	30	89	----	----	----	----	----	----

[XXXIV.—Lakes Superior and Huron low; V-shaped; open northeast; high to the south. Type March 9, 1885. Number of cases, 4.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
Mar. 23, 1880	29.6	47	84	30.3	W.	600	0 to	40 NW.	600
Feb. 22, 1881	29.8	47	86	----	----	----	10	30 NW.	200
Mar. 9, 1885	29.6	47	86	----	----	----	—20	30 NE.	----
Mar. 15, 1888	30.2	----	----	30.4	NW.	----	----	----	----

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[XXXV.—Lakes Superior and Huron low; V-shaped; open northeast; high to the southwest Type November 27, 1887. Number of cases, 11.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance high to low.	Temperatures.	Distance.
	In.	°	°	In.		Miles.	° °	Miles.
Nov. 26, 1883	29.5	47	84	30.4	SW.	900	−20 to 60 NW.	900
Dec. 24, 1883	29.7			30.2	SW.	900	20 60 NW.	500
Jan. 30, 1884	29.3	46	84	30.3	SW.	900	−20 50 NW.	600
Nov. 7, 1885	29.4	45	89	30.2	SW.	700	30 70 NW.	500
Nov. 18, 1886	29.0	46	80	30.3	SW.	900	0 60 NW.	1,000
Nov. 23, 1886	29.1	47	90	30.2	W.	1,300	0 60 NW.	800
Nov. 27, 1887	29.7	46	82	30.5	SW.	500	−30 60 NW.	800
Dec. 4, 1887	29.4	47	90	30.3	SW.	500	−20 50 NW.	1,100
Nov. 2, 1888	29.6	47	79	30.3	SW.	1,400	30 60 NW.	500
Dec. 27, 1888	29.5	46	84	30.3	SW.	800	10 50 NW.	900
Jan. 17, 1889	29.2			30.2	SW.	1,000	−10 40 NW.	700

[XXXVI.—Lakes Superior and Huron low; V-shaped; open northeast; high to northwest. Type March 23, 1882. Number of cases, 22.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance high to low.	Temperatures.	Distance.
Jan. 2, 1881	29.9	47	86	30.3	W.	400	−10 to 20 NW.	300
Oct. 12, 1881	29.8	47	83					
Oct. 15, 1881	29.7	45	87	30.3	W.		20 70 NW.	700
Mar. 23, 1882	29.9	47	87	30.6	NW.	600	0 30 N.	200
Mar. 29, 1882	29.4	48	86				20 50 N.	500
Jan. 3, 1883	30.0	46	83	30.6	W.	500	−30 30 NW.	700
Dec. 1, 1883	29.6	48	89	30.4	W.	800	20 40 N.	500
Feb. 22, 1884	29.8	48	89	30.3	W.	500	−10 30 N.	800
Nov. 16, 1884	29.9	48	88	30.4			20 50 NW.	500
Oct. 7, 1885	30.0			30.3	NW.	400		
Jan. 16, 1886	29.7	46	87	30.5	NW.	500	−10 40 NW.	800
Dec. 26, 1886	29.8	46	85	30.4	NW.	500	−30 20 NW.	600
Jan. 29, 1887	29.6	44	94				−40 30 N.	800
Feb. 8, 1887	29.6	45	84	30.2	W.	500	−20 60 NW.	700
Mar. 24, 1887	29.5	43	89	30.0	NW.	300		
Nov. 3, 1887	29.9	47	92	30.2	W.	700	10 50 N.	400
Nov. 7, 1887	29.5	43	90	30.2	W.	500	30 50 NW.	300
Feb. 7, 1888	29.7	45	82	30.0	W.	500	−30 30 N.	700
Dec. 10, 1888	29.7			30.3	NW.	700	0 30 NW.	600
Dec. 30, 1888	30.1	49	90	30.6	W.	600		
Mar. 26, 1889	29.8	47	89	30.2	NW.	600	30 40	
Nov. 10, 1889	29.6	48	89	30.0				

[XXXVII.—Lakes Superior and Huron low; V-shaped; open northeast; high to northwest; rounded end pointed southeast. Type February 12, 1885. Number of cases, 5.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance high to low.	Temperatures.	Distance.
Feb. 12, 1885	30.0	47	82	30.4	NW.	600	−20 to 20 N.	500
Mar. 24, 1885	29.8	47	84	30.5	NW.	600	−10 40 N.	600
Nov. 5, 1886	29.7	45	82	30.5	W.	900	20 40 NW.	500
Nov. 19, 1887	29.2	45	87	30.5	W.	1,400	0 40 NW.	600
Feb. 20, 1888	29.3	46	85	30.1	NW.	700	−20 40 NW.	700

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[XXXVIII.—Lakes Superior and Huron low; open north; high to northwest; rounded end pointing southeast; like XXXVII with the addition of a low area in Utah or Idaho. Type January 13, 1888. Number of cases, 5.]

Dates.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
	In.	°	°	*In.*		*Miles.*	° °	*Miles.*
Mar. 7, 1887	29.9	47	82	30.4	NW.	600	—10 to 50 NW.	900
Jan. 13, 1888	29.5	46	85	30.8	NW.	800	—30 40 NW.	800
Mar. 13, 1889	29.8	47	79	30.4	NW.	600	—10 40 N.	600
Mar. 27, 1889	29.6	47	82	30.2	W.	500	10 50 N.	900
Dec. 19, 1889	29.8			30.2	NW.		—10 40 NW.	600

[XXXIX.—Lakes Superior and Huron low; open northeast; high to the west; rounding end pointing southwest; area without isobars in southwest; semblance of low in the far southwest in Texas. Type January 13, 1883. Number of cases, 11.]

Jan. 30, 1880	29.6	47	89				—10 to 50 NW.	800
Feb. 12, 1880	29.2	47	84				—10 50 NW.	800
Jan. 21, 1882	29.9	44	85	30.5	W.	800	—20 60 N.	1,300
Jan. 13, 1883	29.4	47	86	30.3	W.	700	—20 30 NW.	500
Oct. 19, 1883	29.9	47	86	30.5	W.		20 60 NW.	
Nov. 11, 1883	29.6	47	85	30.5	NW.	500	0 60 NW.	1,000
Oct. 20, 1885	29.6	47	82	30.2	W.	500	20 60 W.	800
Sept. 30, 1886	29.6	46	84	30.2	W.	600	20 50 N.	700
Oct. 20, 1886	29.8			30.3	SW.	500	30 60 NW.	500
Oct. 24, 1886	29.6	48	87	30.4	W.	700	30 60 NW.	400
Nov. 10, 1886	29.9	46	84	30.4	W.	600	10 40 NW.	300

[XL.—Lakes Superior and Huron low; open northeast; long narrow; peaked southwest; high to the northwest. Type January 11, 1880. Number of cases, 12.]

Jan. 9, 1880	29.5	48	88	30.0	W.	500	—10 to 60 NW.	700
Jan. 11, 1880	29.4	47	87	30.2	NW.	500	—20 60 NW.	600
Feb. 17, 1880	29.7	46	90				0 50 NW.	500
Nov. 17, 1881	29.6	48	91	30.4	W.	500	0 60 NW.	600
Nov. 29, 1881	29.9	47	85	30.2	NW.	500	10 60 NW.	400
Dec. 7, 1883	29.6	47	90	30.6	W.	1,000	10 50 NW.	600
Jan. 22, 1884	29.7	47	80	30.5 30.5	S. NW.	700 1,400		
Nov. 12, 1885	29.5	46	85	30.5	W.	1,300	10 60 NW.	600
Dec. 23, 1885	29.6	47	83	30.4	W.	700	0 60 N.	900
Jan. 25, 1887	29.5	46	84	30.1	NW.	600	—20 40 NW.	700
Mar. 10, 1888	29.9			30.5	NW.	400	—20 50 NW.	800
Dec. 29, 1889	29.3	45	85	30.5	NW.	800	—20 60 NW.	600

[XLI.—Lakes Superior and Huron low; narrow; peaked southwest; open northeast; axis of low more nearly east than in XL. Type February 21, 1889. Number of cases, 3.]

Feb. 8, 1880	29.9	47	88	30.4	W.	400	—10 to 30 N.	200
Jan. 25, 1889	29.8	48	87	30.8	NW.	800	—10 30 N.	400
Feb. 21, 1889	30.0	47	93	30.8	NW.	400	—30 20 N.	500

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[XLII.—Lakes Superior and Huron low; very open; low very extensive high to the south, also at times to the west and northwest. Type January 13, 1884. Number of cases, 16.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
	In.	°	°	*In.*		*Miles.*	°	°	*Miles.*
Jan. 1, 1880	29.6			30.4	SE.	500			
Nov. 15, 1880	29.6	47	87	30.6	W.	1,000			
Dec. 6, 1881	29.6			30.1	W.	500			
Jan. 15, 1882	29.7			30.2	W.		—10 to	40 N.	800
Dec. 1, 1882	29.8			30.5	SW.	1,600			
Feb. 11, 1883	29.7	47	89				—10	60 N.	1,300
Mar. 14, 1883	29.6	47	85	30.3	W.				
Jan. 13, 1884	29.4	47	91	30.3	W. SE.	1,200 1,000			
Jan. 31, 1884	29.2						—20	50 N.	800
Oct. 28, 1884	29.8	50	70	30.3	SW.	1,000	40	60 NW.	400
Dec. 10, 1884	29.9	48	86	30.5	W.	500	10	40 NW.	800
Jan. 20, 1885	29.9	48	87	30.4	W.	900			
Dec. 18, 1885	29.7	49	90	30.5	SW.	600	—10	20	
Feb. 8, 1886	29.6								
Jan. 28, 1887	29.3			30.4 30.5	SW. SE.	1,200 1,000	0	50 NW.	800
Dec. 20, 1888	29.7			30.5	S.	900			

[XLIII.—Wisconsin and Illinois low; long axis of low east of north; inclosed isobars; rounded ends symmetrical; high to the northwest. Type December 4, 1885. Number of cases, 7.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
Feb. 27, 1881	29.5	43	87	30.4	NW.	600	—20 to	50 NW.	800
Feb. 19, 1884	29.5	41	88	30.4	NW.	1,000	—40	50 NW.	1,200
Dec. 4, 1885	29.4	43	89	30.5	NW.	700	10	50 N.	600
Dec. 9, 1885	29.4	43	87	30.2	NW.	600	0	50 NW.	800
Feb. 18, 1887	29.1	43	87	30.4	NW.	1,500	0	60 NW.	1,200
Dec. 20, 1887	29.7	37	89	30.8	NW.	700	—20	40 NW.	500
Dec. 26, 1888	29.5	45	91	30.4	NW.	700	10	50 NW.	500

[XLIV.—Wisconsin low; long axis northwest to southeast; isobars inclosed; rounded ends; high to the west. Type February 26, 1887. Number of cases, 3.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
Jan. 13, 1882	29.8	46	87	30.3	NW.	400	—10 to	50 NW.	900
Mar. 5, 1882	29.5	45	92	30.6	NW.	900	10	60 NW.	800
Feb. 26, 1887	29.4	43	88	30.5	W.	900	—10	50 NW.	800

[XLV.—Michigan low; long axis northeast to southwest; isobars inclosed; rounded ends; high to the northwest. Type February 19, 1886. Number of cases, 6.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
Feb. 28, 1880	29.8	42	88	30.4	NW.	400	—30 to	50 NW.	700
Jan. 13, 1881	29.5	44	86	30.2	NW.	500	—40	40 NW.	700
Dec. 27, 1883	29.6	44	84	30.3	NW.	500	—30	40 NW.	600
Oct. 3, 1885	29.5	45	82	30.3	W.	600	30	60 NW.	800
Feb. 19, 1886	29.6	44	83	30.5	NW.	500	—20	40 NW.	800
Oct. 1, 1888	29.4	45	82	30.2	W.	800	40	60 N.	400

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[XLVI.—Michigan low; northeast to southwest; open southwest; high to the northwest. Type February 16, 1889. Number of cases, 7.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
	In.	°	°	*In.*		*Miles.*	° °	*Miles.*
Oct. 17, 1881	30.0	43	99	30.3	------	------	30 to 70 NW.	800
Nov. 11, 1882	29.8	45	90	30.4	NW.	400	10 70 NW.	600
Mar. 6, 1883	29.7	43	87	30.4	NW.	700	0 60 NW.	1,000
Nov. 9, 1883	29.6	43	84	30.0	W.	500	20 60 NW.	800
Oct. 21, 1884	30.0	45	87	30.4	W.	900	30 60 NW.	400
Nov. 4, 1884	29.9	43	83	30.5	NW.	700	20 50 NW.	1,000
Feb. 16, 1889	29.7	40	90	30.5	NW.	600	—20 60 NW.	1,100

[XLVII.—Double low Michigan; open southwest; low on Pacific coast; high to the northwest in between lows. Type March 2, 1888. Number of cases, 3.]

Jan. 5, 1887	30.1 30.0	45	84	30.7	NW.	800	—30 to 20 NW.	800
Jan. 6, 1888	29.8 29.7	44	86	30.7	NW.	900	—30 60 NW.	1,100
Mar. 2, 1888	29.8 29.6	43	87	30.9	NW.	900	—20 60 NW.	900

[XLVIII.—Michigan low; northeast to southwest; inclosed; high to the west; axis northwest to southeast. Type January 23, 1887. Number of cases, 1.]

Jan. 23, 1887	29.7	42	87	30.4	SW.	900	—20 to 50 NW.	700

[XLIX.—Michigan low; egg-shaped; narrow end extended east; high to the northwest. Type February, 11, 1887. Number of cases, 2.]

Jan. 20, 1880	29.6	41	83	------	------	------	10 to 50	------
Feb. 11, 1887	29.4	43	83	30.5	NW.	900	—30 60 NW.	1,000

[L.—Michigan and Wisconsin low; flaring northeast; high to the west. Type October 14, 1886. Number of cases, 3.]

Nov. 23, 1882	29.7	45	87	30.3	W.	500	10 to 40 NW.	500
Oct. 14, 1886	29.1	41	92	30.0	SW.	500	40 70 NW.	600
Dec. 5, 1888	29.6	43	84	30.3	W.	600	20 40 NW.	500

[LI.—Michigan low; open to the northwest; rounded end southeast; high to the west. Type December 14, 1880. Number of cases, 3.]

Dec. 14, 1880	29.4	45	86	29.9	SW.	------	20 to 40	------
Mar. 25, 1886	29.7	47	83	30.4	W.	------	20 60 NW.	800
Feb. 2, 1889	29.7	45	79	30.7	W.	1,400	10 30 N.	600

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[LII.—Michigan low; in the north of State; low deep; round pointed southwest; high to the northwest; pointed southwest. Type February 25, 1886. Number of cases, 9.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
	In.	°	°	*In.*		*Miles.*	° °	*Miles.*
Mar. 27, 1882	29.3	45	82	30.2	NW.	600	10 to 60 NW.	900
Nov. 23, 1884	29.3	47	83	30.4	NW.	600	—20 50 N.	500
Dec. 22, 1884	29.4	45	82	30.5	NW.	700	—40 50 NW.	1,200
Dec. 31, 1884	29.3	47	81	30.7	NW.	600	—40 50 NW.	1,000
Feb. 25, 1886	29.1	47	84	30.4	NW.	700	—20 40 NW.	700
Jan. 17, 1887	29.4	45	82	30.6	W.	800	—30 40 NW.	900
Mar. 13, 1887	29.8	45	84	30.9	NW.	600	—10 40 NW.	700
Dec. 28, 1887	29.4	46	82	30.8	NW.	900	—30 60 NW.	1,300
Jan. 31, 1889	29.6	46	84	30.5	NW.	1,000	—20 30 NW.	600

[LIII.—Michigan low; V-shaped; open north; high to the west or northwest. Type January 28, 1882. Number of cases, 5.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
Dec. 11, 1880	......	......	......	30.1	......	......	40 to 60 NW.	300
Jan. 8, 1882	29.7	43	87	30.5	W.	1,200	20 60 NW.	800
Jan. 28, 1882	29.9	45	82	30.5	W.	500	—20 60 NW.	1,100
Oct. 8, 1884	29.8	42	80	30.3	W.	500	30 70 NW.	400
Nov. 18, 1885	29.7	43	87	30.3	W.	600	30 60 NW.	700

[LIV.—Double low; Michigan and Atlantic coast; high to the northwest. Type March 10, 1883. Number of cases, 8.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
Dec. 27, 1880	29.8	47	82	30.6	SW.	500	—40 to 30 NW.	900
Mar. 21, 1882	29.5	43	84	30.4	NW.	1,000	0 50 NW.	1,000
Jan. 10, 1883	29.4	38	72	30.5	......	......	......	......
	29.5	43	87					
Mar. 10, 1883	29.4	44	82	30.3	NW.	900	20 to 40 NW.	500
	29.3	37	75					
Mar. 2, 1884	29.6	46	92	30.1	......	......	—30 30 N.	500
	29.6	38	76					
Jan. 24, 1885	29.7	45	84	30.2	NW.	600	—20 40 NW.	700
	29.7	38	75					
Mar. 18, 1885	29.9	43	84	30.4	NW.	1,000	—20 30 NE.	900
Nov. 15, 1888	29.9	......	......	30.5	W.	900	0 50 NW.	1,000

LV.—Michigan low; peculiar wood-grain shape; pressure gradient heavy to the west; light gradient to the east; low, peaked southeast; high to the northwest or west. Type January 9, 1889. Number of cases, 9.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
Feb. 12, 1881	29.4	44	85	30.4	NW.	600	0 to 40 NW.	800
Feb. 28, 1881	29.4	45	82	30.2	NW.	500	—20 40 NW.	900
Feb. 21, 1882	29.3	43	85	30.3	SW.	800	—20 60 NW.	700
Jan. 4, 1886	29.5	44	91	30.5	NW.	700	0 50 NW.	1,000
Mar. 8, 1886	29.6	45	87	30.5	NW.	800	—10 30 NW.	600
Mar. 31, 1886	29.5	42	83	30.1	NW.	......	10 60 NW.	1,000
Feb. 25, 1888	29.0	44	85	30.4	W.	1,500	—10 60 NW.	1,400
Nov. 10, 1888	29.6	44	82	30.2	SW.	1,000	30 70 NW.	1,000
Jan. 9, 1889	29.0	42	87	30.1	SW.	500	0 40 NW.	900

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[LVI.—Michigan low; gradients diminishing southward. Type November 27, 1889. Number of cases, 2.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
	In.	°	°	*In.*		*Miles.*	° °	*Miles.*
Jan. 22, 1880	29.3	43	86	------	------	------	—10 to 40 NW.	800
Nov. 27, 1889	29.8	42	84	30.5	W.	600	10 50 NW.	1,100

[LVII.—Illinois low; triangular shaped. Type March 20, 1886. Number of cases, 2.]

Mar. 9, 1882	29.8	38	89	30.3	NW.	700	10 to 60 NW.	800
Mar. 20, 1886	29.4	40	90	30.2	W.	900	10 60 NW.	700

[LVIII.—Ohio, Kentucky, and Tennessee low; long narrow; flat; extending northeast to southwest; large high to the northwest. Type January 1, 1884. Number of cases, 8.]

Feb. 13, 1880	29.9	36	88	30.5	NW.	500	—10 to 50 NW.	800
Feb. 1, 1881	29.8	36	84	30.6	NW.	700	—10 60 NW.	900
Feb. 11, 1881	29.7	37	87	30.4	NW.	400	20 60 NW.	700
Mar. 19, 1883	29.7	38	84	30.2	NW.	600	0 60 N.	800
Jan. 1, 1884	30.0	36	87	30.9	NW.	1,000	—20 50 NW.	1,100
Jan. 16, 1885	29.9	36	88	30.5	NW.	500	30 60 NW.	1,300
Feb. 5, 1885	29.6	38	88	30.2	NW.	800	—20 50 NW.	1,100
Nov. 12, 1886	29.8	37	87	30.4	NW.	400	20 60 NW.	700

[LIX.—Ohio, Kentucky, and Tennessee low; extensive area; numerous inclosed isobars; high northwest. Type February 9, 1885. Number of cases, 8.]

Mar. 16, 1880	29.8	39	82	30.2	W.	400	0 to 60 NW.	1,000
Nov. 6, 1880	29.8	39	82	30.2	SW.	500	20 60 NW.	800
Mar. 3, 1881	29.4	39	85	30.3	SW.	700	10 50 NW.	600
Mar. 29, 1881	29.6	38	84	30.3	NW.	600	20 50 NW.	800
Feb. 9, 1885	29.5	38	84	30.7	NW.	1,100	—40 60 NW.	1,000
Feb. 15, 1886	29.8	37	82	30.4	W.	500	—20 50 NW.	1,300
Dec. 24, 1886	29.8	40	83	30.4	NW.	600	—30 40 NW.	800
Jan. 27, 1889	29.4	38	85	30.6	NW.	1,300	0 40 NW.	500

[LX.—West Virginia low; high northwest. Type February 5, 1889. Number of cases, 5.]

Mar. 9, 1884	30.0	38	79	30.3	W.	400	10 to 60 NW.	600
Oct. 29, 1887	30.0	43	77	30.5	NW.	500	20 50 NW.	700
Mar. 21, 1888	29.2	43	79	30.7	NW.	1,300	—20 60 NW.	1,100
Feb. 5, 1889	29.4	43	78	30.6	NW.	900	—40 40 NW.	800
Feb. 18, 1889	29.4	40	78	30.3	W.	900	—30 60 NW.	1,400

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[LXI.—Ontario low; V-shaped; very wide; open north; isobars far apart; high to the southwest. Type November 13, 1882. Number of cases, 12.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
	In.	°	°	*In.*		*Miles.*	° °	*Miles.*
Feb. 18, 1880	29.7	46	79	30.4	W.	700	—20 to 50 NW.	900
Nov. 18, 1880	30.1	-----	-----	30.7	SW.	1,300	—10 50 NW.	600
Dec. 8, 1880	29.8	47	80	30.6	SW.	500	—10 40 NW.	700
Nov. 27, 1881	29.8	47	80	30.5	SW.	1,200	20 40	-----
Dec. 1, 1881	29.7	47	76	30.3	SW.	600	20 60 NW.	800
Dec. 29, 1881	29.7	47	77	30.5	SW.	800	20 60 NW.	1,000
Nov. 13, 1882	29.8	44	77	30.4	SW.	1,300	0 60 NW.	800
Feb. 25, 1883	29.5	47	79	30.5	SW.	1,000	—10 40 NW.	900
Nov. 6, 1883	29.6	47	78	30.3	SW.	700	20 60 NW.	700
Jan. 30, 1887	29.6	45	82	30.2	W.	600	—30 40 NW.	800
Oct. 19, 1888	29.6	47	80	30.3	W.	700	30 60 NW.	900
Nov. 6, 1888	29.6	48	78	30.2	SW.	800	20 60 NW.	800

[LXII.—Ontario low; rounded end south; high to the northwest. Type January 12, 1885. Number of cases, 11.]

Nov. 16, 1880	29.9	45	82	30.5	W.	500	10 to 30?	-----
Dec. 13, 1882	29.5	47	82	30.2	-----	-----	—20 30	-----
Feb. 9, 1884	30.0	47	78	30.5	W.	600	—20 50 NW.	700
Feb. 13, 1884	29.6	47	77	30.2	SW.	900	—20 50 NW.	1,000
Jan. 9, 1885	29.3	48	77	30.4	W.	1,200	—10 50 NW.	1,000
Jan. 12, 1885	29.0	47	77	30.4	W.	800	—30 50 NW.	900
Mar. 1, 1885	29.6	45	79	30.5	W.	1,300	10 40 NW.	700
Mar. 15, 1885	29.3	47	79	30.3	SW.	1,300	0 40 NW.	500
Mar. 27, 1885	29.8	47	76	30.2	-----	-----	10 50 N.	700
Nov. 4, 1887	29.5	45	79	30.3	W.	700	10 50 NW.	700
Dec. 26, 1889	29.2	47	79	30.5	SW.	700	—10 60 NW.	900

[LXIII.—Ontario low; rounded end southeast; high to the northwest. Type January 5, 1886. Number of cases, 14.]

Feb. 7, 1880	30.1	44	77	30.5	SW.	400	—10 to 30 NW.	700
Dec. 7, 1881	29.2	47	81	30.3	SW.	700	20 40 NW.	500
Jan. 7, 1883	29.7	45	76	30.3	W.	700	—20 30 NW.	600
Dec. 15, 1884	29.3	45	76	30.4	W.	1,100	—20 30 NW.	700
Jan. 21, 1885	29.7	47	80	39.7	W.	700	—30 30 NW.	1,100
Nov. 13, 1885	29.4	46	79	30.4	W.	1,500	10 60 NW.	1,200
Dec. 19, 1885	29.5	45	77	30.5	W.	1,100	0 30 NW.	600
Jan. 5, 1886	29.4	47	79	30.5	NW.	600	—10 40 W.	1,000
Jan. 17, 1886	29.6	47	75	30.5	W.	900	—30 30 NW.	1,100
Feb. 24, 1887	29.4	45	76	30.5	NW.	900	—30 30 NW.	700
Mar. 25, 1887	29.2	47	71	30.3	W.	1,100	—10 40 N.	800
Nov. 10, 1887	29.7	46	79	30.2	SW.	600	40 60 NW.	500
Feb. 8, 1888	29.6	46	76	30.7	SW.	1,200	—20 40 NW.	900
Feb. 26, 1888	29.5	47	76	30.5	NW.	900	—20 50 NW.	1,400

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[LXIV.—Ontario low; extending to Arkansas; arc-shaped; narrow; low also in Utah; great high to northwest. Type February 3, 1887. Number of cases, 1.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
	In.	°	°	*In.*		*Miles.*	° °	*Miles.*
Feb. 3, 1887	30.1	46	76	31.1	NW.	400	−10 to 60 NW.	1,400

[LXV.—Ontario low; open southeast; high to the northwest. Type January 21, 1886. Number of cases, 3.]

Feb. 26, 1884	29.5	47	76	30.5	NW.	900	−20 to 50 NW.	1,400
Feb. 1, 1885	29.7	44	77	30.6	NW.	700	−30 30 NW.	700
Jan. 21, 1886	29.8	45	80	30.4	NW.	600	−30 30 NW.	1,000

[LXVI.—Ontario low; V-shaped; extensive; many isobars running northwest to southeast. Type January 26, 1885. Number of cases, 4.]

Jan. 26, 1885	29.4	......	......	30.4	SW.	1,400	−30 to 40 NW.	1,400
Feb. 4, 1885	29.2	44	82	30.4	W.	1,800	0 50 N.	1,060
Dec. 10, 1885	29.6	47	70	30.4	W.	1,100	10 60 NW.	700
Nov. 20, 1887	29.5	......	......	30.2	SW.	1,000	0 40 NW.	1,200

[LXVII.—Double low; Ontario and Atlantic coast; high to the southwest and northwest. Type February 10, 1885. Number of cases, 7. Like LIV.]

Jan. 2, 1884	29.4	45	81	30.5	SW.	1,200	−10 to 50 NW.	1,300
Feb. 20, 1884	29.3	47	77	30.4	SW.	660	10 50 NW.	460
Nov. 5, 1884	29.4	45	82	30.5	W.	1,200	−10 50 NW.	1,300
Feb. 10, 1885	29.1	46	74	30.5	SW.	1,200	−30 60 NW.	1,200
Feb. 16, 1885	29.6	......	......	30.1	SW.	....	−30 50 NW.	1,300
Dec. 1, 1886	29.4	45	66	30.7	W.	1,400	−20 50 N.	1,000
Feb. 27, 1887	29.1	45	72	30.7	SW.	1,400	−20 40 NW.	1,300

[LXVIII—Double low; Ontario and Montana. Type January 12, 1887. Number of cases, 3.]

Jan. 12, 1887	29.4	45	81	29.9	NW.	400	−30 to 20 NW.	300
Jan. 20, 1887	29.1	45	90	29.8	NW.	700	−10 40 NW.	600
Dec. 14, 1889	30.0	......	......	30.3	S.	400	−10 60	......

[LXIX.—Quebec low; high to the southwest. Type December 7, 1882. Number of cases, 21.]

Jan. 10, 1880	29.7	50	67	30.3	SW.	700	0 to 40 NW.	800
Jan. 31, 1880	29.5	......	......	30.4	SW.	1,200	0 60 NW.	1,000
Feb. 29, 1880	29.4	47	72	30.2	SW.	890	−20 50 NW.	1,200
Nov. 7, 1880	29.2	49	70	30.2	SW.	1,000	30 60 W.	800
Dec. 6, 1880	29.5	48	66	30.5	SW.	1,400	−30 60 NW.	1,400
Nov. 24, 1881	29.6	45	70	30.6	SW.	1,400	0 50 NW.	1,400
Mar. 24, 1882	29.6	48	70	30.6	SW.	1,200	10 40 NW.	400
Dec. 7, 1882	29.6	47	74	30.8	SW.	700	−20 40 NW.	1,200

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[LXIX.—Quebec low; high to the southwest. Type December 7, 1882. Number of cases, 24—Continued.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to to low.	Temperatures.		Distance.
	In.	°	°	*In.*		*Miles.*	°	°	*Miles.*
Feb. 4, 1883	29.9	45	74	30.7	SW.	1,000	—20	60 NW.	1,000
Feb. 7, 1883	29.5	47	72	30.3	SW.	900	—20	40 NW.	1,000
Feb. 17, 1883	29.7	47	72	30.8	SW.	1,100	—20	60 NW.	1,000
Nov. 14, 1883	29.6	47	69	30.6	SW.	1,000	10	50 NW.	1,000
Nov. 27, 1883	30.0	48	68	30.6	SW.	1,000	—10	60 NW.	1,400
Dec. 2, 1883	29.5	47	72	30.6	SW.	1,000	—10	50 N.	1,000
Feb. 14, 1884	29.4	48	73	30.4	SW.	1,500	0	60 NW.	500
Jan. 25, 1885	29.6	------	------	30.3	SW.	1,600	—30	50 NW.	1,600
Oct. 4, 1885	29.5	47	73	30.1	SW.	1,200	30	60 NW.	600
Dec. 14, 1885	29.5	46	72	30.3	SW.	900	—20	50 NW.	1,300
Nov. 21, 1886	29.2	50	70	30.4	SW.	1,800	0	60 NW.	1,100
Dec. 5, 1887	30.0	------	------	30.4	SW.	600	30	60 NW.	400
Jan. 15, 1888	30.0	46	75	30.9	SW.	900	{—40 {—30	40 NW. 60 NW.	1,000 700
Mar. 28, 1889	29.6	47	72	30.3	SW.	1,000	20	50 NW.	700
Dec. 30, 1889	29.6	43	69	30.6	SW.	1,200	—20	40 NW.	1,000

[LXX.—Quebec low; high to the northwest; rounded end pointing southeast. Type October 22, 1884. Number of cases, 2.]

Oct. 22, 1884	29.6	47	75	30.4	W.	1,000	20 to 50 NW.		800
Feb. 1, 1886	29.8	------	------	30.4	------	------	—30	20	------

[LXXI.—Quebec and Nova Scotia low; open east; rounded projection extending west to Mississippi River. Type March 25, 1881. Number of cases, 4.]

Mar. 25, 1881	29.4	------	------	30.2	W.	------	20 to 50 N.		500
Dec. 21, 1887	29.6	43	70	30.7	SW.	1,500	—30	50 NW.	1,700
Feb. 3, 1889	29.4	50	66	30.7	W.	2,200	—20	30 N.	400
Nov. 14, 1889	29.4	44	65	30.0	SW.	700	40	50	------

[LXXII.—New England low; narrow; extending down the coast; pointed southwest; high to the southwest. Type January 14, 1881. Number of cases, 5.]

Jan. 14, 1881	29.7	------	------	30.4	W.	700	—20 to 50 NW.		700
Mar. 20, 1883	29.6	34	76	30.0	W.	500	0	60 NW.	700
Feb. 1, 1884	29.5	44	70	30.1	SW.	600	0	50 NW.	700
Jan. 26, 1887	29.8	------	------	30.5	SW.	1,200	—20	50 NW.	1,300
Nov. 28, 1887	30.0	45	71	30.6	SW.	700	—20	50 NW.	1,200

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[LXXIII.—New England low; narrow; extending down the coast; pointed southwest; high to the northwest. Type February 21, 1881. Number of cases, 3.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.		Distance.
	In.	°	°	*In.*		*Miles.*	°	°	*Miles.*
Jan. 12, 1880	30.1	------	------	30.6	W.	--------	—30 to	30 NW.	800
Feb. 23, 1881	29.6	------	------	30.5	W.	1,100	0	40 N.	600
Dec. 15, 1886	29.7	------	------	30.4	W.	800	—10	40 NW.	900

[LXXIV.—New England low; cup-shaped; extensive; open north; high to the southwest or northwest. Type January 17, 1885. Number of cases, 7.]

Feb. 3, 1882	29.6	48	69	30.2	SW.	500	0 to	30 NW.	300
Jan. 21, 1883	29.3	47	73	30.4	SW.	900	—20	50 NW.	900
Mar. 2, 1883	29.8	47	68	30.7	W.	1,500	0	50 N.	900
Mar. 15, 1883	29.2	49	69	30.6	W.	1,300	0	50 N.	1,000
Jan. 17, 1885	29.3	44	72	30.9	NW.	-------	—30	60 NW.	1,500
Oct. 15, 1886	29.5	47	71	30.5	W.	1,100	20	60 NW.	1,100
Dec. 2, 1886	29.5	46	69	30.8	W.	1,100	—30	60 N.	1,200

[LXXV.—New England low; cup-shaped; open southeast; high to the northwest. Type February 26, 1886. Number of cases, 4.]

Jan. 21, 1880	29.6	40	97	------	-------	--------	0 to	50	------
Mar. 24, 1880	29.5	45	68	30.5	W.	700	0	40 N.	600
Feb. 26, 1886	29.1	44	71	30.4	NW.	900	0	30 NW.	500
Mar. 12, 1888	29.5	43	71	30.6	W.	700	0	30 N.	600

[LXXVI.—New England low; cup-shaped or triangular; open southeast; high to the southwest Type October 31, 1880. Number of cases, 7.]

Feb. 14, 1880	29.5	44	68	30.1	SW.	800	—10 to	60 NW.	1,400
Oct. 31, 1880	29.3	43	71	30.3	W.	1,900	30	60 NW.	1,000
Feb. 19, 1881	29.8	------	------	30.3	W.	600	0	60 NW.	700
Nov. 9, 1885	29.7	45	68	30.1	W.	600	40	60 NW.	300
Nov. 19, 1885	29.6	44	70	30.2	W.	900	20	50 NW.	800
Feb. 20, 1886	29.8	50	70	30.4	SW.	--------	—10	30 E.	500
Jan. 18, 1888	29.7	44	70	31.0	W.	1,900	—10	60 NW.	900

[LXXVII.—New England low; oblong; northeast to southwest; isobars inclosed; high to the northwest. Type January 6, 1886. Number of cases, 3.]

Oct. 14, 1883	29.8	47	69	30.3	W.	600	40 to	60	------
Oct. 20, 1883	30.1	------	------	30.6	W.	400	—30	60	1,000
Jan. 6, 1886	29.5	45	68	30.5	W.	900	—20	30 W.	1,000

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[LXXVIII.—New England and Gulf St. Lawrence low; isobars northwest to southeast; high to the northwest and southwest and very extensive, with broad front; isobars of high rounded and pointing southeast. Type January 23, 1886. Number of cases, 18.

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
	In.	°	°	*In.*		*Miles.*	° °	*Miles.*
Jan. 28, 1880	29.7	------	------	30.7	W.	1,300	—20 to 40 NW.	800
Feb. 19, 1880	29.5	------	------	30.8	W.	1,300	—30 60 NW.	1,300
Dec. 2, 1880	29.5	------	------	30.4	SW.	1,500	—10 60 NW.	1,200
Jan. 29, 1882	29.4	47	71	30.6	SW.	1,000	—20 60 NW.	1,600
Dec. 6, 1882	29.8	47	71	30.8	W.	1,600	—10 60 N.	1,300
Dec. 14, 1882	29.5	45	69	30.4	W.	1,000	—20 60 NW.	1,200
Dec. 14, 1883	29.2	49	69	30.8	SW.	1,600	0 70 NW.	1,300
Dec. 22, 1883	29.4	------	------	30.7	W.	1,200	—10 20 NW.	------
Jan. 1, 1885	29.4	------	------	30.8	W.	1,400	—40 60 NW.	1,300
Mar. 16, 1885	29.5	47	67	30.7	W.	1,200	—30 30 N.	700
Mar. 19, 1885	29.3	45	63	30.5	W.	1,600	—10 50 NE.	1,000
Jan. 23, 1886	29.5	------	------	30.5	SW.	800	—30 40 NW.	1,000
Nov. 6, 1886	30.0	40	79	30.5	W.	900	20 60 NW.	700
Dec. 25, 1886	29.3	50	64	30.3	--------	--------	0 50 W.	500
Feb. 3, 1888	29.6	------	------	30.6	--------	--------	10 30	------
Feb. 9, 1888	29.5	------	------	30.4	--------	--------	—50 30	------
Mar. 31, 1888	29.7	------	------	30.9	--------	--------	—30 60 N.	1,600
Feb. 23, 1889	29.7	------	------	31.1	W.	1,700	—50 40 NW.	1,400

LXXIX.—New England and Gulf St. Lawrence low; isobars northwest to southeast; high to the northwest and southwest; very extensive; with broad front; isobars of high rounded and pointing southwest; similar to LXXVIII. Type February 4, 1887. Number of cases, 15.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
Oct. 4, 1881	29.6	------	------	30.6	W.	--------	30 to 70 N.	400
Feb. 17, 1882	29.7	46	66	30.9	W.	1,200	—20 50 NW.	800
Dec. 15, 1882	29.2	50	62	30.8	W.	1,400	—30 60 N.	1,400
Mar. 7, 1883	29.5	------	------	30.6	SW.	1,000	—20 60 NW.	1,200
Jan. 14, 1884	29.5 29.9	47 32	67 94	30.5	W. N.	1,100 1,200	—30 50 N.	1,300
Nov. 17, 1884	29.8	45	72	30.5	W.	800	10 50 N.	1,000
Mar. 10, 1885	29.4	45	67	30.6	--------	--------	—10 40 NW.	800
Dec. 24, 1885	29.6	------	------	30.5	SW.	1,600	10 50 NW.	1,000
Dec. 4, 1886	30.0	------	------	30.9	SW.	1,400	—30 60 N.	1,200
Feb. 4, 1887	29.6	------	------	31.0	W.	1,400	—40 30	------
Mar. 3, 1887*	30.0	36	95	30.7	N.	700	0 50 N.	800
Mar. 14, 1887	29.3	------	------	30.6	W.	1,000	0 50 NW.	1,200
Oct. 11, 1887	29.6	------	------	30.6	W.	1,400	30 70 NW.	1,000
Feb. 15, 1888	29.9	------	------	31.0	W.	900	—20 40 NW.	700
Nov. 20, 1888	29.6	47	61	30.7	W.	900	0 50 N.	900

*See Type X.

[LXXX.—New England and Gulf St. Lawrence low; isobars northwest to southeast; high to the northwest and small. Type March 17, 1888. Number of cases, 4.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
Mar. 10, 1880	29.9	------	------	30.2	--------	--------	—30 to 40 N.	900
Mar. 26, 1886	29.5	------	------	30.4	--------	--------	0 40	------
Mar. 16, 1888	29.5	------	------	30.3	--------	--------	—10 40 NW.	800
Mar. 17, 1888	29.3	------	------	30.2	--------	--------	0 40 NW.	600

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[LXXXI.—Gulf St. Lawrence low; high to the southwest. Type November 12, 1883. Number of cases, 14.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
	In.	°	°	In.		Miles.	° °	Miles.
Jan. 2, 1880	29.4	------	------	30.3	SW.	--------	10 to 60 N.	900
Feb. 9, 1880	29.5	------	------	30.4	SW.	500	0 30 NW.	400
Dec. 28, 1880	29.2	47	61	30.4	SW.	1,500	—40 30 NW.	1,200
Dec. 15, 1881	29.9	47	65	30.5	SW.	800	20 50 NW.	800
Jan. 22, 1882	29.3	47	69	30.7	SW.	1,200	—30 50 NW.	1,400
Nov. 12, 1883	29.0	50	67	30.7	SW.	1,300	20 60 NW.	700
Dec. 9, 1883	30.0	------	------	30.5	SW.	1,400	40 60 NW.	------
Nov. 24, 1884	29.3	50	68	30.4	SW.	1,400	—10 50 NW.	1,000
Jan. 10, 1885	29.2	------	------	30.4	SW.	1,300	10 40 NW.	400
Dec. 20, 1885	29.3	45	65	30.4	SW.	1,000	0 30 N.	500
Jan. 18, 1887	28.9	------	------	30.6	SW.	2,000	—30 30 N.	700
Jan. 21, 1887	29.1	------	------	30.2	SW.	1,000	10 40 NW.	300
Feb. 9, 1887	29.2	------	------	30.4	SW.	1,100	10 40 NW.	400
Dec. 13, 1889	29.7	------	------	30.4	SW.	1,300	—20 50 NW.	700

[LXXXII.—Gulf of St. Lawrence low; very extensive; reaching west to lakes; high to the northwest; extending southeast. Type November 13, 1883. Number of cases, 10.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
Jan. 14, 1883	29.5	------	------	30.3	SW.	900	—30 to 40 NW.	1,300
Feb. 8, 1883	29.7	------	------	30.4	SW.	1,000	—10 10	------
Feb. 9, 1883	29.7	------	------	30.6	SW.	1,100	—20 30 N.	900
Mar. 11, 1883	28.9	------	------	30.4	W.	--------	--------	------
Nov. 13, 1883	28.8	------	------	30.7	W.	1,600	0 30 S.	500
Jan. 4, 1884	29.2	------	------	30.4	W.	--------	—40 40 S.	1,100
Dec. 16, 1884	29.2	------	------	30.4	W.	1,600	—20 30 NW.	1,100
Dec. 6, 1885	28.9	------	------	30.2	W.	--------	—20 30 N.	800
Dec. 3, 1886	29.0	------	------	30.9	W.	1,600	—30 60 N.	1,200
Dec. 14, 1886	29.2	------	------	30.6	W.	--------	—10 40 N.	500

[LXXXIII.—New York State low; long from west to east; isobars wide apart in southeast; high to the northwest. Type November 28, 1889. Number of cases, 7.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
Mar. 5, 1880	29.3	43	79	30.1	S.	700	—10 to 60 NW.	700
Jan. 6, 1881	29.6	44	77	30.3	NW.	800	—20 30 NW.	800
Nov. 19, 1881	29.8	43	76	30.6	W.	1,600	—10 60 NW.	1,000
Dec. 5, 1885	29.2	44	78	30.3	SW.	700	—10 40 NW.	700
Mar. 28, 1887	29.6	43	76	30.6	NW.	700	—20 40 NW.	1,100
Dec. 11, 1887	29.9	42	78	30.5	NW.	600	—20 40 NW.	700
Nov. 28, 1889	29.5	43	74	30.8	NW.	1,000	—20 50 N.	1,200

[LXXXIV.—New York State low; open northeast; rounded end southwest; high to northwest. Type December 21, 1888. Number of cases, 1.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
Dec. 21, 1888	29.7	45	74	30.5	W.	600	0 to 30 NW.	800

TABLE VI.—DESCRIPTION OF TYPES OF MAP ACCORDING TO ISOBARS ON DAYS PRECEDING COLD WAVES, ETC.—Continued.

[LXXXV.—Virginia coast low; extending northwest to southeast; high to the northwest. Type. February 28, 1884. Number of cases, 3.]

Date.	Low pressure.	Latitude.	Longitude.	High pressure.	Position from low.	Distance, high to low.	Temperatures.	Distance.
	In.	°	°	*In.*		*Miles.*	° °	*Miles.*
Feb. 23, 1884	29.6	38	76	30.6	NW.	1,200	—10 to 50 NW.	1,400
Feb. 28, 1884	29.2	38	76	30.5	NW.	1,300	—30 60 NW.	1,400
Feb. 18, 1885	29.8	38	75	30.7	NW.	1,600	—20 40 N.	1,200

[LXXXVI.—Virginia coast low; rounded; symmetrical isobars. Type January 28, 1885. Number of cases, 5.]

Mar. 30, 1881	29.2	38	76	30.2	------	------	20 to 50 N.	600
Jan. 9, 1884	29.2	43	74	------	------	------	20 40 W.	200
Jan. 28, 1885	29.6	39	76	30.4	W.	600	—30 50 NW.	1,000
Nov. 13, 1886	29.5	40	74	30.4	SW.	900	20 50 NW.	1,000
Dec. 29, 1887	29.3	48	67	------	------	------	------	------

[LXXXVII.—Virginia coast low; very wide; open to the ocean; extensive high to the northwest. Type January 1, 1887. Number of cases, 7.]

Dec. 26, 1880	29.6	36	76	30.4	NW.	1,300	—10 to 30 NW.	700
Dec. 23, 1881	29.5	43	72	30.5	W.	1,300	10 40 NW.	800
Jan. 19, 1884	29.7	37	76	30.6	NW.	1,000	—10 40 NW.	600
Nov. 23, 1885	29.6	37	76	30.3	NW.	800	40 60 NW.	400
Jan. 1, 1887	29.6	39	72	30.8	NW.	1,100	—40 50 NW.	1,200.
Jan. 6, 1887	29.8	41	72	30.6	W.	1,300	—40 20 NW.	800
Mar. 25, 1889	29.6	35	76	30.0	------	------	20 50.	------

[LXXXVIII.—Georgia, South Carolina low; extensive high to the northwest. Type December 18, 1884. Number of cases, 13.]

Jan. 13, 1880	30.0	34	77	30.5	NW.	400	—20 to 60 NW.	1,400
Dec. 29, 1880	29.9	------	------	30.6	------	------	—10 50 NW.	700
Mar. 26, 1881	29.7	35	77	30.4	NW.	1,000	20 60 N.	700
Jan. 1, 1882	29.7	33	80	30.3	W.	600	20 50 NW.	600
Feb. 4, 1882	29.5	35	82	30.2	W.	700	40 60 NW.	300
Dec. 30, 1882	29.9	33	79	30.8	NW.	1,300	0 40 NW.	1,400
Jan. 5, 1884	30.1	------	------	30.8	NW.	800	—20 40 NW.	600
Dec. 18, 1884	29.9	34	76	30.7	NW.	1,100	—40 60 NW.	1,600
Mar. 22, 1885	29.8	32	79	30.7	NW.	1,400	—10 60 N.	1,000
Nov. 25, 1886	29.7	35	80	30.3	SW.	800	0 60 NW.	1,100
Dec. 5, 1886	29.9	30	77	30.6	NW.	700	10 50 NW.	700
Dec. 17, 1887	29.6	33	80	------	------	------	40 60.	------
Nov. 17, 1889	30.1	33	82	30.5	SW.	600	40 60 NW.	------

In the above descriptions the direction given is that in which the temperature diminishes.

The specimen weather-maps of the various types are given at the end of this paper.

On the accompanying chart is shown the number of low centers of barometric pressure that have occurred in the various 5° areas in latitude and longitude, in ten years past, and also their generalization by lines joining points of equal frequency of occurrence. The lines are in a measure also representative of the relative frequency in the different parts of the country of twenty-four-hour falls in temperature of 20° or more.

From these types it appears, for instance, that with a low in New England and a great high to the southwest, the 20° fall area is crescent-shaped. When the area of low pressure is not perfectly symmetrical, but is curved or crescent-shaped, as in the case of Type XXII, March 11, 1884, the 20° fall area is always similarly curved. Type XXXI, which is a highly important one, shows the power of a great area of high pressure to distort, as it were, a low pressure area.

There are in all eighty-eight types of maps.

The number of cases in the different types vary. Type XXXVI, for instance, a V-shaped low in the vicinity of Lake Superior with a high to the northwest, has 22 cases, while XLVIII, a low in Michigan with high to the southwest, its long axis pointing southeast, has only a single case.

A slight inspection of the weather maps of the day preceding the occurrence of cold waves will show that the extent of the temperature fall and its magnitude is dependent on the extent of the low and high areas of pressure. The greater the area of country covered by the low pressure and the greater its depth, the greater will be the extent of temperature fall. But the extent of temperature fall is also found to depend materially on the density or frequency of the isothermal lines in the region covered by the high and low areas of pressure.

There is always some slight diminution of temperature in going from the Ohio Valley, for instance, towards the northwest. No matter how slight this temperature gradient may be, if there is a low area of barometer, it is apt to be followed by a fall of temperature. But without some area of low pressure or a very great area of high pressure back of the crowded isothermal lines, no matter how close the lines may be, and they are not apt to be very close under such circumstances, there will not follow any fall of temperature. It often happens that there is a crowded condition of the isotherms, with only a slight elevation of pressure, 30.3 to 30.4 inches, extending over a considerable area of country and yet there follows no fall of temperature. This seems to indicate that there is some considerable part of every high area of pressure and even the whole of some of the areas that is merely the result of the low temperature, and not its cause. There seems to be some condition of gradient of temperature corresponding with slight increase of pressure when the air is nevertheless in a condition of equilibrium or no tendency to motion as a whole, and no falls of temperature ensue to the southeast of the high area of pressure. A condition of this kind occasionally lasts for some time, as on January 4 and 5, 1890.

An extensive low area of pressure in Colorado and thereabout is connected in some way that is not understood with the tarrying of these areas of high pressure to the northeast of them, in Nebraska, Dakota, and Minnesota.

Table VII shows in a number of instances of cold-waves the magnitude of the fall of temperature and the extent of fall dependent on the magnitude and the extent of the pressure and temperature gradients.

The first column contains the date of the occurrence of the lower temperature; the second contains the place of greatest fall; the third, the temperature before the fall, where greatest; the fourth, the fall of temperature; the fifth, the temperature gradient or diminution of temperature in a distance of 500 miles; the sixth, the width of area over which the contrast of temperature extends; the seventh, the pressure gradient or increase of pressure in a distance of 500 miles; the eighth, the highest and lowest isobar and the shortest distance between them; the ninth, the extent of cold wave within the 20° fall line, the unit of extent being a fall of 20° over an area of 50,000 square miles.

There are two maps in ten years on which the maximum temperature in twenty-four hours was 60° or greater from 7 a. m.. of one day to 7 a. m. of the next. This comprises all of the 60° falls on the morning maps. There may have been some falls of 60° on the afternoon or evening maps which were not noticed, as these maps were not examined exhaustively.

There are 16 maps in the ten years where the maximum falls in cold waves were between 50° and 60°. There are 77 where the maximum falls are between 40° and 50°.

The cases of maximum 20° and 30° falls being very numerous, about sixty of each were selected, or one from each cold-wave month in the ten years, for the purpose of comparing pressure and temperature gradients on them with temperature-falls occurring the next day.

Sixty cases were also selected where the maximum temperature-falls were between 10° and 20°. These are not, however, classed as cold waves.

Chart A. Frequency of Low Pressure Centers, preceding Cold Waves. Appendix No 5

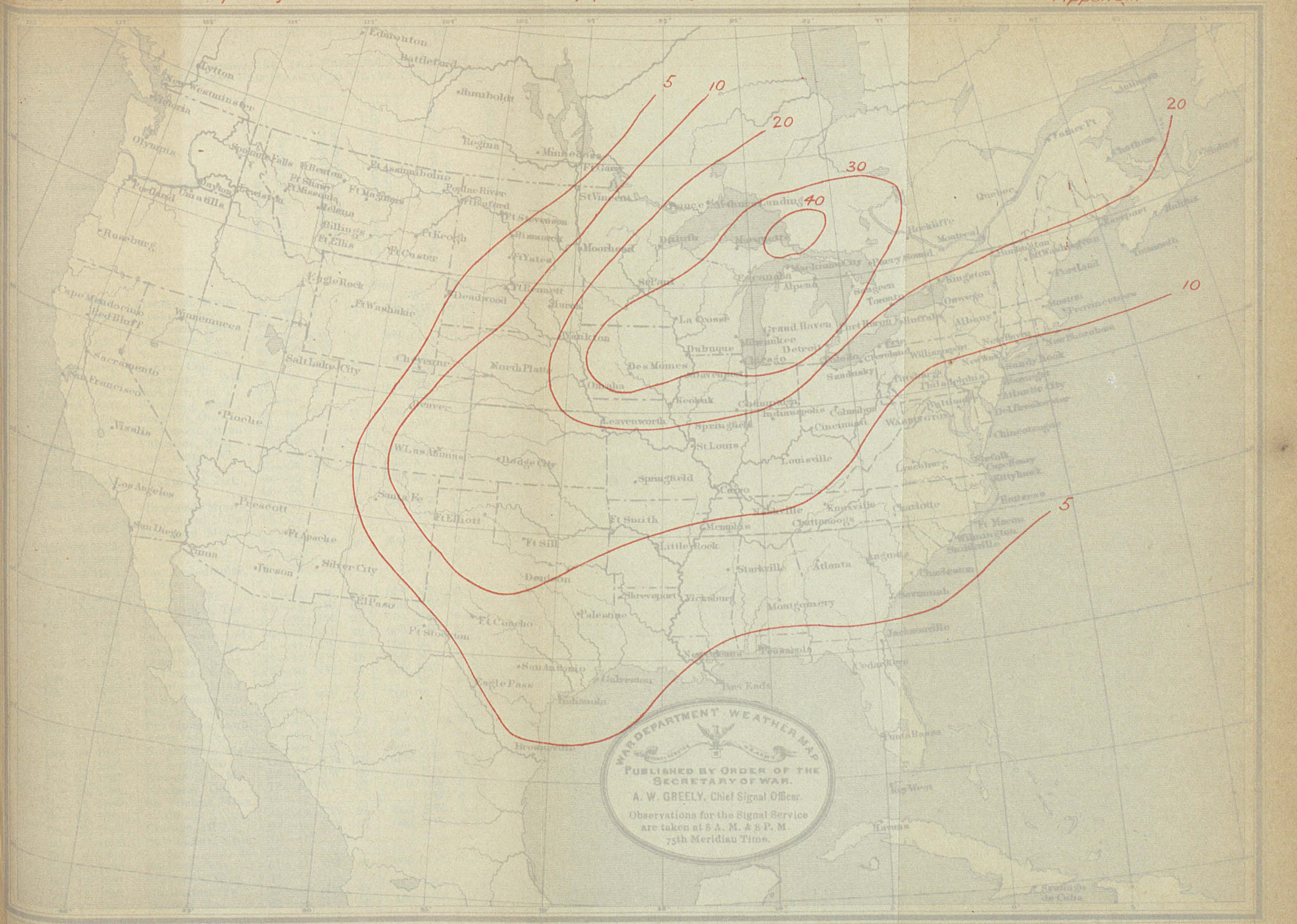


TABLE VII.—FALLS OF TEMPERATURE AND PRESSURE AND TEMPERATURE GRADIENTS ON THE DAY PRECEDING COLD WAVES, 1880 TO 1890.

Date.	Place.	Temperature.	Fall in past 24 hours.	Temperature gradient or change in 500 miles.		Extent of temperature gradient.	Pressure gradient in 500 miles.		Distance apart of highest and lowest isobar.	Extent of cold wave.
						Miles.		Inch.	Miles.	
Jan. 14, 1884	Moorhead, Minn	37	—63				W.	0.38	1,200	
Feb. 17, 1883	Keokuk, Iowa	60	—60	W.	54	650	NW.	0.63	800	
Nov. 28, 1887	Cincinnati, Ohio	64	—56				W.	0.67	600	
	Louisville, Ky	68	—58	NW.	78	500				
	Nashville, Tenn	66	—54	NW.	63					
Dec. 24, 1884	Denver, Colo	48	—50	NE.	56	800	NE.	0.70	400	
Dec. 1, 1886	Bismarck, N. Dak	35	—52				NW.	0.50	400	
Jan. 14, 1881	Fort Sill, Ind. T	57	—50	N.	50	1,000	NW.	0.50		
Jan. 18, 1884	Winnipeg, Man	28	—51				SW.	0.57	700	
Jan. 13, 1885	Rockliffe, Ont	33	—54	W.	47	750	W.	0.78	900	
Jan. 12, 1887	St. Vincent, Minn	20	—52				SW.	0.45	1,000	
Jan. 13, 1888	Valentine, Nebr	30	—50							
Feb. 11, 1885	Cape Henry, Va	64	—50	NW.	43	1,100	SW.	0.64	1,100	
Feb. 11, 1887	Lamar, Mo	63	—54	NW.	61	600	N.	0.73	550	
Feb. 14, 1888	Yankton, S. Dak	40	—50	N.	50	500	N.	0.50	400	
Feb. 5, 1889	do	44	—50							
	Moorhead, Minn	18	—54	N.	58	500	NW.	0.79	700	
Mar. 18, 1883	Fort Buford, N. Dak	43	—50				SW.	0.50	800	
	Moorhead, Minn	...	—51							
Nov. 26, 1883	do	38	—52	NW.	46	600	W.	0.50	400	
Jan. 26, 1889	do	24	—50				NW.	0.75	600	
Feb. 16, 1882	Fort Assinniboine, Mont.	41	—53							
Nov. 19, 1881	Denison, Tex	70	—42	NW.	37	1,000	NW.	0.37	1,050	14.9
Nov. 12, 1882	Fort Elliott, Tex	63	—46	NW.	65	450	NW.	0.37	1,050	12.9
Nov. 23, 1884	Kansas City, Mo	52	—40	NW.	37	700	NW.	0.50	600	14.2
Nov. 24, 1884	Indianapolis, Ind	56	—44	NW.	48	600	NW.	0.83	600	20.7
Nov. 23, 1886	Kansas City, Mo	61	—41	NW.	43	600	N.	0.86	500	12.6
Nov. 27, 1887	Concordia, Kans	32	—42	NW.	45	800	N.	0.45	1,000	28.5
Dec. 27, 1880	La Crosse, Wis	25	—40	NW.	37	500	NW.	0.36	550	19.4
Dec. 14, 1883	Moorhead, Minn	33	—40				W.	0.48	900	
Dec. 15, 1883	Parry Sound, Ont	35	—48	NW.	37	700	W.	0.54	1,300	28.2
Dec. 18, 1883	Bismarck, N. Dak	39	—49				SW.	0.60	750	
Dec. 27, 1883	Des Moines, Iowa	37	—45	N.	72	500	N.	0.50	600	12.2
Dec. 31, 1884	Palestine, Tex	64	—41	NW.	62	500	N.	0.34	1,300	4.3
Dec. 20, 1887	North Platte, Nebr	30	—48	NW.	37	600	NW.	0.66	600	20.2
Dec. 21, 1887	St. Louis, Mo	42	—42	NW.	56	450	NW.	0.60	950	9.2
Dec. 28, 1887	Kansas City, Mo	32	—42	NW.	86	300	NW.	0.55	450	16.2
Dec. 22, 1888	Kingston, Ont	32	—40	W.	25	650	NW.	0.58	700	3.4
Dec. 19, 1889	St. Vincent, Minn	34	—42				NW.	0.50	400	
Dec. 29, 1889	do	24	—44	NW.	25	600	NW.	0.43	800	15.7
Dec. 30, 1889	Chicago, Ill	60	—44	NW.	67	600	NW.	0.60	600	21.1
Jan. 2, 1880	St. Vincent, Minn	31	—41							
Jan. 6, 1880	do	25	—44							
Jan. 12, 1880	Madison, Wis	51	—41	NW.	61	600	NW.	0.66	650	22.4
Jan. 13, 1881	Cheyenne, Wyo	38	—41							
Jan. 15, 1881	Burlington, Vt	37	—45	NW.	47	700	SW.	0.36	1,100	23.0
Jan. 17, 1882	Denison, Tex	60	—44	NW.	58	450	NW.	0.67	450	32.5

TABLE VII.—FALLS OF TEMPERATURE AND PRESSURE AND TEMPERATURE GRADIENTS ON THE DAY PRECEDING COLD WAVES, 1880 TO 1890—Continued.

Date.	Place.	Temperature.	Fall in past 24 hours.	Temperature gradient or change in 500 miles.	Extent of temperature gradient.	Pressure gradient in 500 miles.	Distance apart of highest and lowest isobar.	Extent of cold wave.
					Miles.	*Inch.*	*Miles.*	
Jan. 20, 1883	La Crosse, Wis	25	—40	NW. 45	700	NW. 0.58	700	17.5
	Corpus Christi, Tex	67	—45	N. 51	600	N. 0.40	600	
Jan. 19, 1884	Omaha, Nebr	37	—41	N. 50	600	NW. 0.54	650	21.0
Jan. 23, 1884	Fort Buford, N. Dak	23	—45			NW. 0.40		
Jan. 1, 1885	Alpena, Mich	48	—43	NW. 55	800	NW. 0.82	800	29.9
Jan. 12, 1885	Duluth, Minn	26	—47	NW. 49	400	W. 0.37	800	24.6
Jan. 17, 1885	Montgomery, Ala	68	—45	NW. 35	1,400	NW. 0.55	550	12.4
Jan. 18, 1885	Norfolk, Va	70	—45	NW. 36	1,400	W. 0.54	1,400	13.5
Jan. 6, 1886	Rockliffe, Ont	38	—45	W. 24	1,000	NW. 0.61	900	11.4
Jan. 7, 1886	Cheyenne, Wyo	23	—46	N. 41	500	N. 0.42	600	14.6
Jan. 18, 1886	Rockliffe, Ont	28	—43	W. 28	1,000	NW. 0.50	900	6.4
Jan. 13, 1887	Parry Sound, Ont	20	—49	W. 34	900			
Jan. 17, 1887	Lamar, Mo	53	—42	NW. 37	900	NW. 0.50	700	16.2
Jan. 18, 1887	Chattanooga, Tenn	58	—40	NW. 49	700	W. 0.72	900	17.8
Jan. 21, 1887	La Crosse, Wis	37	—40	NW. 53	500	NW. 0.58	600	6.6
Jan. 27, 1887	Eastport, Me	34	—40	W. 50	700			
Jan. 30, 1887	Yankton, S. Dak	30	—42	N. 60	500	W. 0.57	700	14.1
Jan. 31, 1887	Parry Sound, Ont	30	—46	NW. 55	600	W. 0.55	550	8.0
Jan. 1, 1888	Palestine, Tex	64	—40	N. 49	650	NW. 0.62	650	11.0
Jan. 8, 1888	do	68	—48	NW. 68	500	W. 0.42	700	14.7
Jan. 15, 1888	do	48	—44	NW. 49	650	N. 0.39	650	15.8
Jan. 20, 1888	Cheyenne, Wyo	34	—42	NE. 54	700	N. 0.50		6.1
Feb. 29, 1880	St. Louis, Mo	62	—42	NW. 54	650	NW. 0.58	600	13.4
Feb. 24, 1881	Quebec, Quebec	28	—48			W. 0.52	900	
Feb. 18, 1882	Eastport, Me	41	—43	W. 40	500	W. 0.43	1,500	
Feb. 4, 1883	Shreveport, La	68	—42	NW. 51	900	NW. 0.50	700	10.3
Feb. 16, 1883	Moorhead, Minn	30	—42					
Feb. 15, 1884	Rockliffe, Ont	22	—43	W. 26	900	SW. 0.34	1,300	10.4
Feb. 9, 1880	St. Paul, Minn	30	—40	NW. 50	500	NW. 1.00	300	6.8
Feb. 20, 1884	Davenport, Iowa	45	—42	NW. 52	600	W. 1.00	350	26.4
Feb. 27, 1884	Moorhead, Minn	26	—46			NW. 0.33		
Feb. 2, 1885	Parry Sound, Ont	10	—43	W. 26	1,000	NW. 0.50	1,050	8.7
Feb. 10, 1885	Nashville, Tenn	62	—44	NW. 46	1,100	NW. 0.58	1,100	25.8
Feb. 17, 1885	Toronto, Ont	29	—40	NW. 37	800	SW. 0.38	600	7.3
Feb. 25, 1886	Bismarck, N. Dak	37	—43	NW. 60	300	W. 0.50	650	22.4
Feb. 26, 1886	Parry Sound, Ont	33	—40	W. 36	900	W. 0.93	700	17.8
Feb. 1, 1887	Fort Elliott, Tex	45	—40	N. 44	850	N. 0.60	750	13.8
Feb. 4, 1887	Palestine, Tex	67	—42	N. 54	800	N. 0.50	600	9.5
Feb. 10, 1887	Rapid City, S. Dak	36	—43	N. 45	600	N. 0.50	500	11.2
Feb. 12, 1887	Columbus, Ohio	63	—44	NW. 52	800	W. 0.80	600	29.4
Feb. 25, 1887	Rockliffe, Ont	21	—43	NW. 38	800	W. 0.61	900	12.6
Feb. 7, 1888	Huron, S. Dak	30	—48	N. 62	400	W. 0.32	600	4.7
Feb. 15, 1888	Kingston, Ont	34	—42	NW. 47	750	W. 0.50	1,000	25.5
Feb. 16, 1888	Boston, Mass	38	—40	NW. 53	550	W. 0.55	900	11.1
Feb. 25, 1888	Moorhead, Minn	34	—42			W. 0.36	1,100	5.7
Feb. 6, 1889	Toronto, Ont	36	—46	NW. 44	900	NW. 0.67	900	9.6
Feb. 23, 1889	Erie, Pa	32	—40	NW. 50	600	W. 0.46	1,200	19.8
Mar. 2, 1887	Fort Buford, N. D	45	—49			W. 0.50	700	15.6

TABLE VII.—FALLS OF TEMPERATURE AND PRESSURE AND TEMPERATURE GRADIENTS ON THE DAY PRECEDING COLD WAVES, 1880 TO 1890—Continued.

Date.	Place.	Temperature.	Fall in past 24 hours.	Temperature gradient or change in 500 miles.	Extent of temperature gradient.	Pressure gradient in 500 miles.	Distance apart of highest and lowest isobar.	Extent of cold wave.
					Miles.	*Inch.*	*Miles.*	
Mar. 7, 1887	Qu'Appelle, Assin.	27	—43			SW. 0.45	1,050	9.8
Mar. 13, 1887	Minnedosa, Man.	25	—42			W. 0.40	500	13.1
Mar. 19, 1888	Qu'Appelle, Assin.	40	—48			W. 0.40	1,000	
Mar. 20, 1888	Keokuk, Iowa	56	—40	NW. 50	600	NW. 0.70	500	7.5
Mar. 21, 1888	Bismarck, N. Dak.	34	—40			W. 0.40		
Oct. 16, 1880	Fort Smith, Ark.	71	—33			NW. 0.55		
Oct. 8, 1884	Dodge City, Kans.	63	—30	NW. 36	600	NW. 0.38	400	4.4
Oct. 21, 1886	Marquette, Mich.	66	—30	NW. 30	600	SW. 0.42	600	4.1
Oct. 20, 1888	Fort Smith, Ark.	68	—30	NW. 48	400	NW. 0.50	350	3.5
Nov. 7, 1880	Montgomery, Ala.	67	—31	NW. 35	550	NW. 0.44	550	7.2
Nov. 18, 1881	Kansas City, Mo.	61	—36	NW. 53	600	NW. 0.33	750	9.8
Nov. 20, 1881	Knoxville, Tenn.	66	—38	NW. 37	900	W. 0.40	850	6.3
Nov. 14, 1882	Atlanta, Ga.	64	—33	NW. 31	700	SW. 0.38	800	9.0
Nov. 27, 1883	Louisville, Ky.	63	—30	NW. 38	1,100	SW. 0.56	800	14.8
Nov. 25, 1884	Eastport, Me.	53	—31			SW. 0.50	1,100	
Nov. 13, 1885	Fort Smith, Ark.	63	—34	NW. 36	600	W. 0.50	900	11.9
Nov. 18, 1886	New Orleans, La.	74	—39	NW. 42	800	NW. 0.76	700	12.4
Nov. 26, 1886	Charleston, S. C.	68	—33	NW. 38 NW. 29	600 1,200	SW. 0.43	700	8.6
Nov. 20, 1887	St. Louis, Mo.	46	—30	NW. 32	550	W. 0.77	650	5.1
Dec. 6, 1880	Louisville, Ky.	60	—38	NW. 75	400	SW. 0.92	450	11.2
Dec. 14, 1881	St. Louis, Mo.	60	—30	NW. 50	700	NW. 0.32	700	11.5
Dec. 8, 1882	Wilmington, N. C.	50	—33	NW. 44 NW. 32	500 1,150	SW. 0.85	800	23.5
Dec. 31, 1883	Palestine, Tex.	66	—33	NW. 48	400	NW. 0.29	500	4.3
Dec. 19, 1884	Wilmington, N. C.	53	—35	NW. 37	1,000	NW. 0.36	1,150	11.6
Dec. 5, 1885	Kansas City, Mo.	50	—35	NW. 30	750	W. 0.86	700	24.1
Dec. 16, 1886	Pensacola, Fla.	54	—30	NW. 32 NW. 32	550 1,200	NW. 0.60	700	8.0
Dec. 29, 1887	Wilmington, N. C.	60	—32	NW. 40	900	SW. 0.92	600	21.4
Dec. 25, 1888	Des Moines, Iowa	52	—32	NW. 50	500	NW. 0.50	500	1.9
Dec. 25, 1889	do	60	—34	NW. 40	900	NW. 0.75	400	6.8
Dec. 7, 1882	North Platte, Nebr.	35	—39	NW. 28	800	NW. 0.31	800	21.5
Dec. 15, 1886	Omaha, Nebr.	42	—38	NW. 42	600	W. 0.62	800	21.8
Jan. 10, 1880	La Crosse, Wis.	49	—31	NW. 66	450	NW. 0.90	400	9.1
Jan. 7, 1881	do	17	—30	NW. 40	550	NW. 0.46	600	5.3
Jan. 14, 1882	Milwaukee, Wis.	35	—35	NW. 41	550	W. 0.59	450	3.8
Jan. 14, 1883	Duluth, Minn. Shreveport, La.	16 60	—38 —34	W. 55 NW. 70	300 500	W. 0.85 NW. 0.60	700 400	14.9
Jan. 19, 1883	Dodge City, Kans.	22	—38	N. 43	600	N. 0.58	600	
Jan. 6, 1884	Charlotte, N. C.	40	—32	NW. 50	600	NW. 0.50	800	5.8
Jan. 25, 1885	Kansas City, Mo.	31	—31	NW. 49	800	NW. 0.50	500	8.1
Jan. 9, 1886	Montgomery, Ala.	47	—39	NW. 53	500	W. 0.80	500	12.6
Jan. 2, 1887	Wilmington, N. C.	59	—34	NW. 41 NW. 31	600 1,500	W. 0.55	1,000	13.4
Jan. 14, 1888	Toledo, Ohio	40	—36	W. 62 NW. 45	400 800	SW. 0.90	500	18.3
Jan. 17, 1889	St. Paul, Minn.	38	—32	NW. 30	650			14.3

TABLE VII.—FALLS OF TEMPERATURE AND PRESSURE AND TEMPERATURE GRADIENTS ON THE DAY PRECEDING COLD WAVES, 1880 TO 1890—Continued.

Date.	Place.	Temperature.	Fall in past 24 hours.	Temperature gradient or change in 500 miles.	Extent of temperature gradient.	Pressure gradient in 500 miles.	Distance apart of highest and lowest isobar.	Extent of cold wave.
					Miles.	*Inch.*	*Miles.*	
Jan. 29, 1887	Fort Custer, Mont.	27	—33	----	----	SW. 0.64	700	----
Feb. 20, 1881	Norfolk, Va	65	—32	N. 54	600	W. 0.50	500	2.2
Feb. 14, 1880	Chattanooga, Tenn.	66	—30	NW. 40	800	NW. 0.22	900	3.2
Feb. 13, 1881	Lynchburgh, Va	59	—31	W. 27	1,000	NW. 0.80	700	4.3
Feb. 21, 1882	Memphis, Tenn	66	—30	NW. 50 NW. 48	450 1,000	W. 0.40	700	7.0
Feb. 18, 1883	Washington City	60	—30	NW. 43	700	SW. 0.60	900	22.6
Feb. 14, 1884	Cincinnati, Ohio	55	—35	NW. 55	500	SW. 0.40	900	9.4
Feb. 16, 1885	St. Louis, Mo	40	—39	NW. 40	700	NW. 0.52	900	4.4
Feb. 16, 1886	Knoxville, Tenn	58	—33	NW. 35	800	NW. 0.64	550	4.7
Feb. 9, 1887	Alpena, Mich	46	—38	NW. 46	700	NW. 0.50	600	11.3
Feb. 26, 1888	Toledo, Ohio	48	—34	NW. 36	600	NW. 0.80	500	7.1
Feb. 17, 1889	St. Paul, Minn Springfield, Mo	28 56	—34 —30	NW. 40 NW. 38	600 600	NW. 0.50 NW. 0.40	800 500	9.6
Mar. 8, 1880	Alpena, Mich	34	—30	NW. 46	750	NW. 0.80	500	3.4
Mar. 4, 1881	Chattanooga, Tenn.	58	—30	NW. 30	800	NW. 0.78	450	3.4
Mar. 21, 1882	Fort Smith, Ark	66	—30	NW. 37	800	NW. 0.50	700	13.0
Mar. 19, 1883	Kansas City, Mo	53	—38	NW. 53	750	NW. 0.75	600	24.1
Mar. 12, 1884	Fort Smith, Ark La Crosse, Wis	66 40	—32 —31	NW. 40 NW. 30	800 650	W. 0.55	800	12.1
Mar. 25, 1885	Parry Sound, Ont.	19	—30	----	----	W. 0.45	800	----
Mar. 14, 1887	Cincinnati, Ohio	54	—30	NW. 35	1,000	NW. 0.75	800	5.3
Mar. 3, 1888	St. Louis, Mo	60	—36	NW. 70 NW. 53	500 750	W. 0.65	650	12.6
Mar. 16, 1889	Springfield, Mo	54	—32	NW. 44	500	NW. 0.60	500	1.0
Oct. 5, 1881	Pittsburgh, Pa	68	—24	NW. 54	900	NW. 0.23	1,100	12.1
Oct. 17, 1880	Columbus, Ohio	65	—26	W. 23	750	S. 1.00	600	3.8
Oct. 13, 1881	Kansas City, Mo	69	—28	NW. 46	600	W. 0.46	800	3.7
Oct. 16, 1882	Yankton, S. Dak	62	—27	NW. 50	300	----	----	2.9
Oct. 15, 1883	Boston, Mass	71	—29	NW. 66	250	W. 0.42	600	2.7
Oct. 22, 1884	Keokuk, Iowa	63	—23	NW. 42	450	NW. 0.40	350	1.1
Oct. 4, 1885	Detroit, Mich	65	—23	NW. 16	900	W. 0.45	900	0.6
Oct. 16, 1886	Albany, N. Y	63	—26	NW. 20	800	SW. 0.50	700	6.5
Oct. 12, 1887	Atlanta, Ga	62	—20	NW. 17	1,100	NW. 0.37	800	----
Oct. 19, 1888	Kansas City, Mo	68	—22	NW. 23	950	NW. 0.50	700	2.6
Oct. 9, 1887	Des Moines, Iowa	66	—20	NW. 31	550	NW. 0.62	450	0.6
Nov. 3, 1888	Indianapolis, Ind	68	—26	NW. 34	550	SW. 0.27	1,100	4.8
Nov. 19, 1880	New York City	46	—23	SW. 12	650	SW. 0.35	900	2.2
Nov. 24, 1882	Chicago, Ill	39	—18	NW. 24	600	SW. 0.60	500	----
Nov. 6, 1883	Kansas City, Mo	65	—29	NW. 45	600	W. 0.55	450	8.1
Nov. 5, 1884	Louisville, Ky	58	—21	NW. 23	600	NW. 0.38	800	0.6
Nov. 14, 1885	Washington City	54	—21	NW. 20	900	SW. 0.40	1,100	4.1
Nov. 14, 1885	Atlanta, Ga	61	—26	----	----	----	----	----
Nov. 13, 1886	Chattanooga, Tenn	60	—28	NW. 30	700	NW. 0.60	500	3.6
Nov. 23, 1887	Fort Sully, S. Dak	28	—28	NW. 30	700	NW. 0.50	650	4.1
Nov. 9, 1888	Vicksburg, Miss	68	—24	NW. 30	700	NW. 0.65	700	4.1
Nov. 28, 1889	Mobile, Ala	64	—24	NW. 26	650	W. 0.48	600	2.8
Nov. 12, 1889	Fort Elliott, Tex	40	—18	NW. 50	500	NW. 0.59	600	4.8

TABLE VII.—FALLS OF TEMPERATURE AND PRESSURE AND TEMPERATURE GRADIENTS ON THE DAY PRECEDING COLD WAVES, 1880 TO 1890—Continued.

Date.	Place.	Temperature.	Fall in past 24 hours.	Temperature gradient or change in 500 miles.	Extent of temperature gradient.	Pressure gradient in 500 miles.	Distance apart of highest and lowest isobar.	Extent of cold wave.
					Miles.	*Inch.*	*Miles.*	
Dec. 9, 1880	Louisville, Ky	36	—25	NW. 40	700	SW. 0.70	500	2.4
Dec. 21, 1881	Denison, Tex	54	—22	NW. 34	500	NW. 0.71	450	0.7
Dec. 15, 1882	Keokuk, Iowa	25	—20	NW. 34	650	NW. 0.34	650	2.7
Dec. 8, 1883	La Crosse, Wis	50	—26	NW. 34	600	W. 0.50	1,000	6.1
Dec. 13, 1884	Atlanta, Ga	64	—26	NW. 27	1,000	NW. 0.43	700	1.2
Dec. 11, 1885	Wilmington, N. C.	62	—26	NW. 32	800	SW. 0.30	850	5.2
Dec. 6, 1886	Jacksonville, Fla	53	—24	NW. 31	850	NW. 0.45	800	0.5
Dec. 12, 1887	La Crosse, Wis	24	—22	NW. 54	350	NW. 0.50	650	0.4
Dec. 6, 1888	do	38	—20			W. 0.50		
Dec. 11, 1889	Springfield, Mo	62	—26	NW. 32	500	SW. 0.50	400	7.8
Jan. 21, 1880	Nashville, Tenn	58	—21	NW. 27	900	NW. 0.38	600	
Jan. 3, 1881	Des Moines, Ia	23	—24	NW. 50	350	NW. 0.75	200	1.6
Jan. 9, 1882	Louisville, Ky	57	—23	NW. 34	650	W. 0.45	700	2.3
Jan. 18, 1883	Davenport, Ia	28	—23	NW. 30	800	NW. 0.48	800	8.5
Jan. 12, 1884	Mobile, Ala	58	—28	N. 45 N. 40	550 900	NW. 0.47	550	3.6
Jan. 26, 1885	Columbus, Ohio	30	—22	NW. 29	1,100	SW. 0.27	1,100	2.0
Jan. 22, 1886	Erie, Pa	37	—21	W. 37	600	SW. 0.45	550	3.8
Jan. 24, 1887	Knoxville, Tenn	63	—29	NW. 33 NW. 38	650 1,100	SW. 0.37	950	8.6
Jan. 2, 1888	do	54	—30	NW. 40	700	SW. 0.75	600	5.7
Jan. 9, 1889	Palestine, Tex	56	—26	NW. 35	800	NW. 0.46	750	4.7
Feb. 8, 1880	Pittsburgh, Pa	35	—23	NW. 38	500	SW. 0.50	400	
Feb. 9, 1882	Shreveport, La	60	—20	NW. 41	500	NW. 0.38	500	
Feb. 25, 1883	Lamar, Mo	50	—24	NW. 23	650	NW. 0.36	700	4.4
Feb. 6, 1884	Pittsburgh, Pa	60	—21	NW. 40	800	W. 0.45	550	4.8
Feb. 8, 1885	Kansas City, Mo	36	—22	N. 37	750	NW. 0.42	600	5.7
Feb. 10, 1886	Springfield, Mo	51	—20	NW. 30	700	NW. 0.58	600	3.1
Feb. 20, 1888	Dubuque, Iowa	42	—27			NW. 0.54	550	7.5
Feb. 18, 1889	Palestine, Tex	56	—28	NW. 43	700	NW. 0.33	600	5.4
Feb. 19, 1887	Louisville, Ky	58	—25	NW. 21	700	SW. 0.64	600	3.2
Mar. 17, 1880	Atlanta, Ga	61	—26	NW. 35	900	NW. 0.40	500	0.6
Mar. 27, 1881	Augusta, Ga	62	—22	N. 30	700	W. 0.70	500	
Mar. 10, 1882	Memphis, Tenn	64	—21	NW. 35	800	NW. 0.37	800	1.0
Mar. 3, 1883	Pittsburgh, Pa	54	—26	NW. 35	800	W. 0.32	1,100	12.1
Mar. 10, 1884	Wilmington, N. C.	61	—23	NW. 27	1,100	W. 0.44	400	3.8
Mar. 17, 1885	Cincinnati, Ohio	30	—21	NW. 37	800	NW. 0.45	900	5.0
Mar. 10, 1886	Shreveport, La	50	—20	NW. 40	650	NW. 0.40	500	1.0
Mar. 3, 1887	St. Louis, Mo	60	—27	NW. 45	800	NW. 0.50	700	5.1
Mar. 12, 1888	Charleston, S. C.	60	—24	NW. 33 NW. 27	600 1,500	W. 0.53	750	6.5
Mar. 15, 1889	Concordia, Kans	52	—28	NW. 47	550	N. 0.60	500	1.5
Mar. 21, 1886	Indianapolis, Ind	59	—27	NW. 35	700	NW. 0.50	650	3.4
Mar. 13, 1886	Davenport, Iowa	30	—15					
Oct. 23, 1887	Fort Custer, Mont.	34	—22	NE. 20	500	NW. 0.42	600	
Oct. 20, 1885	St. Louis, Mo	63	—23	NW. 27	550	NW. 0.40	1,000	
Oct. 20, 1886	North Platte, Nebr.	58	—27	NW. 30	500	NW. 0.30	1,000	
Oct. 24, 1887	Valentine, Nebr	32	—28	NW. 25	1,000	NW. 0.45	1,000	

TABLE VII.—FALLS OF TEMPERATURE AND PRESSURE AND TEMPERATURE GRADIENTS ON THE DAY PRECEDING COLD WAVES, 1880 TO 1890—Continued.

Date.	Place.	Temperature.	Fall in past 24 hours.	Temperature gradient or change in 500 miles.	Extent of temperature gradient.	Pressure gradient in 500 miles.	Distance apart of highest and lowest isobar.	Extent of cold wave.
					Miles.	*Inch.*	*Miles.*	
Oct. 2, 1888	Moorhead, Minn	48	—26	NW. 20	500	NW. 0.50	800	-----
Nov. 11, 1882	Denver, Colo	44	—32	NW. 28	900	-----	200	-----
Nov. 13, 1882	Shreveport, La	68	—32	NW. 50	850	SW. 0.50	500	-----
Nov. 7, 1883	Columbus, Ohio	55	—21	NW. 22	900	SW. 0.50	800	-----
Nov. 10, 1883	Alpena, Mich	45	—12	NW. 22	900	W. 0.40	500	-----
Nov. 12, 1883	Nashville, Tenn	63	—29	NW. 27	1,100	W. 0.65	700	-----
Nov. 13, 1883	Savannah, Ga	69	—26	NW. 23	1,100	SW. 0.65	1,300	-----
Nov. 15, 1883	Lynchburgh, Va	49	—23	NW. 22	900	SW. 0.45	1,000	-----
Nov. 6, 1884	Boston, Mass. Wilmington, N. C.	54 57	—21 —20	NW. 22	450	SW. 0.55	900	-----
Nov. 30, 1884	Dodge City, Kans	38	—11	NE. 20	800	W. 0.42	600	-----
Nov. 7, 1885	Lamar, Mo	64	—29	NW. 34	500	W. 0.45	700	-----
Nov. 8, 1885	Columbus, Ohio	63	—22	NW. 22	900	SW. 0.60	700	-----
Oct. 27, 1880	Toledo, Ohio	54	—16	NW. 18	500	NW. 0.44	500	-----
Oct. 30, 1881	Des Moines, Iowa	55	—15	NW. 22	500	NW. 0.40	500	-----
Oct. 14, 1882	Louisville, Ky	67	—16	NW. 22	700	SW. 0.30	700	-----
Oct. 14, 1883	St. Louis, Mo	58	—15	NW. 20	700	N. 0.24	700	-----
Oct. 26, 1884	Oswego, N. Y	39	—13	NW. 15	500	W. 0.50	300	-----
Oct. 4, 1885	Indianapolis, Ind	59	—18	NW. 25	900	NW. 0.45	900	-----
Oct. 14, 1886	Kansas City, Mo	69	—16	NW. 24	600	W. 0.30	700	-----
Oct. 5, 1887	Nashville, Tenn	56	—12	NW. 16	500	SW. 0.25	1,000	-----
Oct. 3, 1888	Chattanooga, Tenn	62	—14	NW. 20	800	W. 0.40	1,000	-----
Oct. 2, 1889	Cincinnati, Ohio	60	—12	NW. 17	600	SW. 0.50	600	-----
Nov. 11, 1880	Cario, Ill	58	—16	NW. 28	500	SW. 0.62	400	-----
Nov. 13, 1881	Cincinnati, Ohio	65	—17	NW. 17	600	SW. 0.58	600	-----
Nov. 24, 1882	Chicago, Ill	39	—18	NW. 20	500	SW. 0.60	500	-----
Nov. 16, 1883	do	15	— 5	NW. 20	500	SW. 0.72	400	-----
Nov. 11, 1884	Columbus, Ohio	45	—12	NW. 12	800	W. 0.24	650	-----
Nov. 2, 1885	Cincinnati, Ohio	49	—13	NW. 16	650	SW. 0.40	750	-----
Nov. 4, 1886	Sandusky, Ohio	53	—15	NW. 12	800	SW. 0.45	1,000	-----
Nov. 10, 1887	St. Louis, Mo	52	—12	NW. 22	500	W. 0.24	650	-----
Nov. 17, 1888	Washington City	50	—14	NW. 20	750	SW. 0.40	1,000	-----
Nov. 14, 1889	Indianapolis, Ind	50	—12	NW. 20	500	NW. 0.24	1,300	-----
Dec. 17, 1880	Albany, N. Y	36	—17	NW. 20	500	SW. 0.37	800	-----
Dec. 5, 1881	Montgomery, Ala	59	—14	NW. 20	500	NW. 0.30	500	-----
Dec. 3, 1882	Cleveland, Ohio	40	—17	NW. 24	500	NW. 0.60	500	-----
Dec. 9, 1883	Columbus, Ohio	40	—15	NW. 22	700	SW. 0.35	1,100	-----
Dec. 6, 1884	Shreveport, La	57	—12	NW. 24	650	NW. 0.40	500	-----
Dec. 26, 1885	Pittsburgh, Pa	32	—11	NW. 23	700	NW. 0.30	700	-----
Dec. 13, 1886	St. Louis, Mo	55	—18	NW. 24	600	W. 0.45	800	-----
Dec. 13, 1887	Lynchburgh, Va	46	—16	NW. 20	600	SW. 0.30	1,100	-----
Dec. 7, 1888	do	42	—18	NW. 15	750	SW. 0.50	500	-----
Dec. 6, 1889	do	46	—14	NW. 16	800	SW. 0.50	500	-----
Jan. 18, 1880	Indianapolis, Ind	55	—19	NW. 21	600	SW. 0.24	650	-----
Jan. 6, 1880	Washington City	50	—12	NW. 20	500	NW. 0.21	500	-----
Jan. 22, 1881	Fort Smith, Ark	20	—10	N. 20	500	SW. 0.25	1,100	-----
Jan. 10, 1882	Washington City	45	—15	NW. 17	600	SW. 0.45	1,000	-----
Jan. 12, 1883	Augusta, Ga	36	—13	NW. 23	500	W. 0.42	600	-----

TABLE VII.—FALLS OF TEMPERATURE AND PRESSURE AND TEMPERATURE GRADIENTS ON THE DAY PRECEDING COLD WAVES, 1880 TO 1890—Continued.

Date.	Place.	Temperature.	Fall in past 24 hours.	Temperature gradient or change in 500 miles.		Extent of temperature gradient.	Pressure gradient in 500 miles.		Distance apart of highest and lowest isobar.	Extent of cold wave.
						Miles.		*Inch.*	*Miles.*	
Jan. 15, 1884	Washington City	33	—15	NW.	40	300	NW.	0.25	900	-----
Jan. 3, 1885	Charlotte, N. C.	22	—11	NW.	20	600	NW.	0.28	600	-----
Jan. 11, 1887	Washington City	25	—13	NW.	31	400	SW.	0.30	1,300	-----
Jan. 6, 1888	Philadelphia, Pa	38	—12	NW.	38	500	NW.	0.24	500	-----
Jan. 5, 1889	St. Louis, Mo	40	—10	NW.	14	700	NW.	0.20	700	-----
Feb. 26, 1880	Chicago, Ill	54	—15	NW.	43	700	NW.	0.50	500	-----
Feb. 17, 1881	Pittsburgh, Pa	36	—16	NW.	35	600	SW.	0.62	400	-----
Feb. 10, 1882	Nashville, Tenn	56	—18	NW.	26	500	SW.	0.38	800	-----
Feb. 20, 1883	Chicago, Ill	38	—19	NW.	32	600	W.	0.50	500	-----
Feb. 17, 1884	Shreveport, La	56	—12	NW.	36	500	N.	0.48	600	-----
Feb. 15, 1885	Kansas City, Mo	19	—11	N.	30	500	W.	0.25	950	-----
Feb. 5, 1886	Charlotte, N. C	21	—14	NW.	21	500	NW.	0.44	800	-----
Feb. 22, 1887	Fort Smith, Ark	43	—11	NW.	23	500	NE.	0.10	800	-----
Feb. 6, 1888	Chicago, Ill	24	—18	NW.	26	700	W.	0.30	1,000	-----
Feb. 9, 1889	Memphis, Tenn	46	—12	N.	26	700	W.	0.22	1,400	-----
Mar. 28, 1880	St. Louis, Mo	61	—19	NW.	24	650	NW.	0.90	500	-----
Mar. 9, 1881	Keokuk, Iowa	34	—11	NW.	20	500	SW.	0.25	400	-----
Mar. 11, 1882	New York City	50	—15	NW.	31	400	W.	0.50	1,000	-----
Mar. 24, 1883	Nashville, Tenn	43	—13	NW.	24	700	W.	0.40	500	-----
Mar. 1, 1884	St. Louis, Mo	36	—17	N.	46	500	W.	0.40	1,000	-----
Mar. 7, 1885	....do	42	—11	N.	25	650	N.	0.40	500	-----
Mar. 17, 1886	Lynchburgh, Va	55	—17	N.	30	500	SW.	0.35	300	-----
Mar. 22, 1887	Columbus, Ohio	33	—11	NW.	13	500	W.	0.50	1,200	-----
Mar. 13, 1888	New York City	24	—18	NW.	17	600	W.	0.70	800	-----
Mar. 1, 1889	Palestine, Tex	62	—16	NW.	26	500	N.	0.38	400	-----

In forming the means of greatest temperature falls, and the corresponding mean pressure and temperature gradients shown in Table VIII, the 60° falls are included with the 50° to 60° falls. Many cases had to be omitted in forming the means, as the pressure or temperature gradients could not be determined with sufficient exactness, on account of the area of low temperature or high pressure extending beyond the region of observation. Table VIII, which is a résumé of Table VII, shows that the magnitude and extent of temperature falls depends closely on the magnitude of the temperature and pressure gradients. There does not seem to be any discernible relation between the temperature fall and gradients dependent on the month in which the cold wave occurs.

TABLE VIII.—MEAN TEMPERATURE-FALLS, TEMPERATURE AND PRESSURE GRADIENTS IN "HIGHS" AND "LOWS" PRECEDING COLD WAVES.

Months—	No. of cases in the mean.	Extent of fall.	Mean temperature-fall.	Mean 500-mile pressure gradient.	Mean 500-mile temperature gradient.
			°	*Inches.*	°
	9	26.1	—53.6	0.66	55
Nov.-Dec	15	15.7	—43.2	0.56	47
Jan	21	15.6	—43.4	0.53	48
Feb.-Mar	23	13.9	—42.2	0.59	46
Oct.-Nov	12	8.1	—32.9	0.49	38
Dec	12	14.0	—34.1	0.61	43
Jan	9	10.8	—34.7	0.63	51
Feb	11	7.8	—33.6	0.53	43
Mar	8	9.4	—32.3	0.67	43
Oct	11	3.7	—24.4	0.49	35
Nov	11	3.8	—23.6	0.49	29
Dec	9	3.0	—24.1	0.48	35
Jan	10	3.4	—24.7	0.48	36
Feb	8	4.4	—22.9	0.37	34
Mar	11	4.0	—24.1	0.47	36
Oct			—14.7	0.38	20
Nov			—13.4	0.45	19
Dec			—15.2	0.41	21
Jan			—13.3	0.29	25
Feb			—14.6	0.38	30
Mar			—14.8	0.48	26

SUMMARY OF PRESSURE AND TEMPERATURE GRADIENTS AND MEAN TEMPERATURE-FALLS.

No. of cases in the mean.	Extent of fall.	Mean temperature-fall.	Mean 500-mile pressure gradient.	Mean 500-mile temperature gradient.
9	26.1	—53.6	0.66	55
59	15.1	—43.3	0.56	47
52	10.0	—33.5	0.59	44
60	3.7	—24.0	0.46	34
60		—14.3	0.40	23

It appears from an inspection of the maps that the extent of cold wave and magnitude of temperature fall are dependent on the extent of the high and low pressure and the character of the temperature gradient. It may be possible to establish the numerical relation between them from a consideration of special cases.

An examination of the temperature-falls in a cold wave, as they are generalized by lines of 10°, 20°, and 30° fall, etc., on the maps, shows that graphically they may be taken as cones; not right cones, however. The maximum temperature-fall is the altitude of the cone; the 10°, 20°, 30°, etc., temperature-fall lines are sections of the cone by planes. The section lines are for the greater part elliptical in appearance, generally quite regular, but in a few cases somewhat irregular. Sometimes they are nearly circular; occasionally an area is triangular-shaped with rounded corners; sometimes they present the appearance of long, narrow strips of a crescent shape; occasionally they are egg-shaped.

There is a certain degree of conformity in the shapes of the temperature-fall curves of the same cold wave. All the temperature-fall curves pertaining to any particular cold wave, each one inside the other, have the same shape approximately. A triangle, for instance, will not be found inside of a circle or ellipse. The higher the order of the curve the more nearly does it approach regularity of shape. That is to say, the 20° fall-curve usually represents, some regular area more nearly than the 10° curve. The 30° curve, where there is one, represents the same figure more nearly than the 20° curve, and so on for the higher order of curves. This fact has significance in some cases. The curves of very great temperature-fall, however, may have a regular shape without its having any special significance. When there is only a single station with a fall greater than the even 20°, 30°, or 40° fall the draughtsman makes the curve indicating this with a perfect regularity.

Occasionally these temperature-fall areas show wide deviations from regularity. They are all in fact more or less irregular. The areas are for the greater part, however, satisfactorily representable by perfectly regular figures, which are for the most part ellipses. Any temperature curve of 20° or greater fall in a cold wave is always representable with some degree of approximation to accuracy by a perfectly regular ellipse. It is meant by this that if, instead of the outlines which do actually represent the temperature falls, they were replaced by perfectly regular ellipses of proper dimensions they would then represent the actual falls of temperature, with errors in most cases of not more than 2° or 3°, and in some cases 5° or 6°. In only a very few cases would the errors be as great as 10°.

The following shows the accuracy with which the actual 20° temperature-fall area is represented by the section lines of exact cones in various cases of cold waves. Taking the unit of extent of cold wave as previously described, and taking the maximum fall of temperature as its altitude, the areas given in third column in square miles were computed. The actual areas observed are shown alongside of them.

Areas of 20° temperature-fall as observed and as computed on supposition of "extent" of fall being a cone.

Date.	Observed.	Computed.	Date.	Observed.	Computed.
	Square miles.	*Square miles.*		*Square miles.*	*Square miles.*
Oct. 16, 1882	126,000	115,000	Nov. 27, 1883	567,000	480,000
Oct. 15, 1883	116,000	140,000	Nov. 5, 1884	26,000	----------
Oct. 8, 1884	170,000	230,000	Nov. 6, 1884	27,000	----------
Oct. 22, 1884	48,000	----------	Nov. 23, 1884	531,000	580,000
Oct. 15, 1886	63,000	----------	Nov. 24, 1884	682,000	780,000
Oct. 4, 1882	26,000	45,000	Nov. 7, 1885	70,000	85,000
Oct. 20, 1885	----------	----------	Nov. 8, 1885	62,000	50,000
Oct. 20, 1886	96,000	85,000	Nov. 13, 1885	460,000	530,000
Oct. 19, 1888	111,000	----------	Nov. 13, 1886	155,000	90,000
Oct. 16, 1886	279,000	----------	Nov. 23, 1886	456,000	480,000
Oct. 9, 1887	27,000	----------	Nov. 18, 1886	450,000	390,000
Oct. 11, 1887	----------	----------	Nov. 26, 1886	302,000	285,000
Oct. 23, 1887	140,000	30,000	Nov. 20, 1887	203,000	230,000
Oct. 24, 1887	287,000	270,000	Nov. 23, 1887	178,000	160,000
Oct. 2, 1888	174,000	----------	Nov. 27, 1887	891,000	980,000
Nov. 7, 1880	282,000	270,000	Nov. 28, 1887	806,000	740,000
Nov. 19, 1881	509,000	510,000	Nov. 9, 1888	176,000	60,000
Nov. 20, 1881	271,000	305,000	Nov. 12, 1889	205,000	----------
Nov. 11, 1882	263,000	335,000	Nov. 28, 1889	120,000	130,000
Nov. 12, 1882	388,000	565,000	Dec. 9, 1880	103,000	90,000
Nov. 13, 1882	482,000	460,000	Dec. 21, 1881	30,000	10,000
Nov. 14, 1882	335,000	330,000	Dec. 27, 1883	451,000	440,000
Nov. 6, 1883	350,000	300,000	Dec. 13, 1884	51,000	50,000
Nov. 7, 1883	155,000	----------	Dec. 31, 1884	391,000	440,000
Nov. 12, 1883	298,000	280,000	Dec. 5, 1885	864,000	810,000
Nov. 13, 1883	320,000	220,000	Dec. 20, 1887	751,000	640,000
Nov. 15, 1883	57,000	35,000	Dec. 21, 1887	338,000	440,000
Nov. 26, 1883	830,000	----------	Dec. 28, 1887	564,000	530,000

Areas of 20° temperature-fall as observed and as computed on supposition of "extent" of fall being a cone—Continued.

Date.	Observed.	Computed.	Date.	Observed.	Computed.
	Square miles.	*Square miles.*		*Square miles.*	*Square miles.*
Dec. 29, 1887	830,000	610,000	Feb. 17, 1883	1,065,000	990,000
Dec. 25, 1888	80,000	140,000	Feb. 25, 1883	189,000	110,000
Dec. 11, 1889	334,000	220,000	Feb. 6, 1884	208,000	....
Dec. 25, 1889	258,000	210,000	Feb. 20, 1884	895,000	890,000
Dec. 29, 1889	566,000	750,000	Feb. 8, 1885	244,000	40,000
Dec. 30, 1889	749,000	750,000	Feb. 10, 1885	960,000	880,000
Jan. 12, 1880	813,000	750,000	Feb. 11, 1885	787,000	800,000
Jan. 15, 1881	848,000	700,000	Feb. 16, 1885	155,000	270,000
Jan. 14, 1882	134,000	210,000	Feb. 10, 1886	132,000	....
Jan. 17, 1882	1,101,000	1,350,000	Feb. 16, 1886	201,000	260,000
Jan. 14, 1883	554,000	640,000	Feb. 26, 1886	606,000	690,000
Jan. 18, 1883	324,000	140,000	Feb. 1, 1887	215,000	170,000
Jan. 19, 1883	322,000	200,000	Feb. 4, 1887	336,000	485,000
Jan. 20, 1883	385,000	440,000	Feb. 9, 1887	426,000	390,000
Jan. 6, 1884	220,000	260,000	Feb. 11, 1887	543,000	610,000
Jan. 19, 1884	703,000	750,000	Feb. 12, 1887	1,015,000	970,000
Jan. 1, 1885	1,060,000	1,060,000	Feb. 19, 1887	140,000	90,000
Jan. 17, 1885	415,000	440,000	Feb. 25, 1887	446,000	....
Jan. 18, 1885	487,000	570,000	Feb. 15, 1888	912,000	885,000
Jan. 25, 1885	319,000	270,000	Feb. 16, 1888	440,000	370,000
Jan. 9, 1886	397,000	390,000	Feb. 20, 1888	280,000	265,000
Jan. 17, 1887	621,000	530,000	Feb. 26, 1888	260,000	355,000
Jan. 18, 1887	660,000	750,000	Feb. 6, 1889	356,000	410,000
Jan. 21, 1887	239,000	330,000	Feb. 17, 1889	372,000	380,000
Jan. 24, 1887	369,000	280,000	Feb. 23, 1889	634,000	770,000
Jan. 30, 1887	474,000	485,000	Mar. 4, 1881	132,000	136,000
Jan. 1, 1888	422,000	530,000	Mar. 10, 1882	41,000	....
Jan. 8, 1888	525,000	600,000	Mar. 21, 1882	490,000	420,000
Jan. 15, 1888	513,000	580,000	Mar. 19, 1883	848,000	830,000
Jan. 20, 1888	235,000	265,000	Mar. 12, 1884	468,000	420,000
Jan. 9, 1889	259,000	190,000	Mar. 17, 1885	216,000	....
Jan. 17, 1889	551,000	540,000	Mar. 10, 1886	41,000	....
Feb. 14, 1880	220,000	160,000	Mar. 21, 1886	144,000	145,000
Feb. 28, 1880	299,000	350,000	Mar. 3, 1887	219,000	195,000
Feb. 29, 1880	506,000	440,000	Mar. 14, 1887	227,000	230,000
Feb. 13, 1881	163,000	275,000	Mar. 3, 1888	478,000	480,000
Feb. 21, 1882	272,000	250,000	Mar. 20, 1888	283,000	390,000
Feb. 4, 1883	337,000	355,000	Mar. 16, 1889	42,000	40,000

The place of greatest temperature fall is usually about half way between the northwestern and southeastern boundary of the 10° temperature-fall area when the isotherms are at nearly equal distances apart. In some cases, which depend on the isobars being more crowded towards the southeast than in the northwest, the greatest fall is nearer to the southeastern side of the 10° temperature-fall area. In this latter case it is usually one-third of the distance across the 10° fall area from its southeastern boundary.

In case a high area of pressure is to the southwest of a low area, and the high is relatively much more intense than the low, that is, greater pressure and temperature gradients within it, the place of greatest temperature-fall is apt to be to the south of the center of the 10° temperature fall area. In this case also there is apt to be a long stretch of nearly uniform great temperature fall, so it is not possible to locate the maximum fall of temperature accurately, nor is it important in this case.

In devising a plan for forecasting cold waves it has been borne in mind that to be of any value it must be of great simplicity and susceptible of easy and ready application in any particular case. The time available, after the weather map is drawn, for any computations pertaining to the occurrence of cold waves is somewhat limited in the practical work of forecasting. A method to be of practical use should not require more than half an hour for working out in all its details. This limit of time has been constantly kept in mind in considering a method. Theoretical treatment of this question would require some knowledge of the gradient of temperature upward in the air. This is only known for the average from balloon ascents and not for all special cases. It would therefore be necessary to make some assumption on this point. This being the case, an empirical treatment may just as well be adopted from the start.

A physico-mathematical treatment, even if it were possible, would certainly involve such extensive work that it would take a very long time to make the computations. In the mean time the cold wave would have passed.

The following is the plan that has been devised for forecasting cold waves.

First.—The magnitude or "extent" of a cold wave that is to follow any special map or ensemble of isobars and isotherms, as they arise on the weather maps from day to day, is to be determined from the extent of the high and low areas of pressure, and the character of the isotherms, whether close together or far apart. Numerical expressions will be sought for this relation by the discussion of particular cases of cold wave that have occurred in the past. This magnitude or "extent" will be a number which expresses the cubic contents of a cone in which the altitude is expressed in tens of degrees and the base in hundred-thousands of square miles as units.

Second.—A method will be derived for determining what the maximum fall of temperature in the cold wave is to be. This is dependent on the magnitude of the pressure and temperature gradients from the center of the area of low pressure towards the north, northwest, or west. There are three characteristic regions in the vicinity where a cold wave is about to occur which limit very generally the place of greatest temperature fall. These are the center of low area of pressure, the convexities of the highest isotherms, and the region of greatest density of isotherms or greatest temperature gradient. The place of greatest temperature fall, where a cold wave is about to occur, is very usually in or near one of these regions. It can be located somewhere within an area of 50,000 square miles in most cases. The greater the cold wave the more definitely it can be located.

The greatest temperature fall expressed, in 10° as the unit, is the altitude of the cone of cold-wave "extent."

Third.—In any prospective cold wave, the extent of cold-wave or cubic contents of the cone being known, and its altitude, which is the maximum fall in temperature, the areas of the 10° and 20° temperature fall lines can be determined from suitably prepared tables for that purpose.

Fourth.—The various shapes the 20° temperature-fall areas take with different types of low and high areas of pressure will be determined. The shape of the area will be taken as exactly elliptical and the relation between its major and minor axis will be determined.

Fifth.—The position of the 20° temperature-fall area will be determined. The center or place of greatest fall will be approximately known. A point of tangency to the 20° fall curve of the preceding day, or where this does not occur, a characteristic overlapping of the 10° fall curves, or some other means will be devised which will determine the position of the area.

The number of square miles and the lengths of the axis of the 20° temperature-fall area being known, a previously prepared piece of card-board of the shape and proper size, according to the scale of the map, will be laid on the map and the 20° temperature-fall line drawn around it. The center of the area will be the place of maximum fall. When there are temperature-fall curves of 30°, 40°, etc., these will be drawn in by estimation from the position of the 20° fall and the center. The prospective temperature falls at the various stations covered by the areas can then be estimated, with the aid of the lines, and the isotherms drawn through the area covered by the fall. A slight adjustment will be possible at this stage of the proceeding. The isotherms in the area where a cold wave is prevailing always have a certain smoothness and definiteness of sweep easily recognizable; their concavities are always turned to the northwest. If the computed temperatures make the isotherms run irregularly, a sort of an average position can be selected with a smooth sweep to the lines. With these adjusted isotherms the 20°, etc., temperature-fall curves can again be constructed and then will have a more realistic shape corresponding to the shapes that actually occur.

FIRST.—EXTENT OF COLD WAVE.

For the purpose of determining the relation between the extent of cold wave and the extent of area of low and high pressure preceding it, 127 cases of cold waves were taken from the whole number, 621, that have occurred in ten years. These were selected so as to include the greatest possible variety in the extent of the various cold waves, the greatest and least low and high areas of pressure concerned in their production, and the greatest diversity in the relative positions of the high and low areas, and widest variety in the character of isotherms passing through the areas. A number of cases were included in this discussion where the 10° temperature-fall areas were large, but which can not, however, really be classed as cold waves because the fall of temperature was not sufficiently great or the temperature did not go low enough.

In these 127 cases the areas between successive isobars were measured with a planimeter. The areas between the successive isotherms were also measured covering the same extent of country as the areas of high and low pressure.

The areas inclosed by the 20°, 30°, etc., temperature-fall lines were measured as has been previously described. These are given in Table I. As the investigation proceeded it became manifest that the amount of temperature fall between the 10° and 20° fall curves was too great to be neglected. Accordingly the areas inclosed by the 10° fall curves for the 127 cases under consideration were measured. These are given in Table XIV. These areas are in many cases more or less inaccurate on account of their projection into regions where there are no observations. The curves in such cases, before measurement could be made, had to be completed by estimation.

It would have been advisable to have included also in the measurements the areas between the 10° temperature-fall line and the zero-change line if it could have been done with any tolerable degree of accuracy. But this it was not possible to do on account of the want of definition of the zero-change line in most cases.

These measurements for the various cases of cold waves are given in Table IX. Column 1 gives the date of the lower temperature; column 2 gives the extent of high pressure, the unit of extent being an excess of one inch of pressure over an area of 100,000 square miles; column 3 gives the area in square miles above a certain isobar, covered by the high; column 4 gives the extent of low pressure, a deficiency of one inch of pressure over an area of 100,000 square miles being taken as unity; column 5 gives the area in square miles covered by the low pressure below a certain isobar, which is also given in the same column; column 6 gives the greatest fall of temperature; column 7 gives the position of center of high area of pressure from the center of low pressure, the letter "L" indicating a low alone without any accompanying high area; column 8 gives the mean temperature of the area covered by the area of high and low pressure; column 9 gives the excess of temperature throughout the low above the mean temperature, an excess of 10° over an area of 100,000 square miles being considered as unity; column 10 gives a certain function of the areas between the isothermal lines, corresponding to the density or sparseness of the isothermal lines; column 11 gives the difference between highest and lowest isobars, and the least distance between them in miles, on the date preceding the cold wave; column 12 gives the highest temperature in the vicinity of the low area of pressure and the lowest temperature in high area, and their distance apart in miles, on the day preceding the cold wave; column 13 contains the magnitude or extent of fall in the cold wave, the unit being a fall of 10° over a area of 100,000 square miles; it includes allowance for the fall between the 20° and the 10° temperature-fall lines.

TABLE IX.—MEASURED EXTENTS OF "HIGHS" AND "LOWS" PRECEDING COLD WAVES.—EXTENT OF COLD WAVE.—MEAN TEMPERATURE IN HIGH AND LOW AREA, ETC.

1	2	3	4	5		6	7	8	9	10	11		12			13
Date of cold wave.	Extent of high.	Area of high above isobar.	Extent of low.	Area of low below isobar.		Greatest fall of temperature.	Position of high center from low center.	Mean temperature in high and low area.	Excess of temperature above mean.	Isothermal number.	Difference of highest and lowest pressure and distance apart.		Highest and lowest temperature and distance apart.			Extent of cold wave.
				Isobar.	Area.						Difference.	Distance apart.	Lowest.	Distance apart.	Highest.	
		Sq. miles.			Sq. miles.	°		°	°				°	Miles.	°	
Oct. 16, 1882			1.10	29.9	934,000	—27	NW.	44	1.8	4.8			30	450	.62	9.7
Oct. 15, 1883			0.79	30.0	709,000	—29	SW.	42	3.1	6.8	0.5	600	40	290	71	10.7
Oct. 8, 1884	1.36	755,000	0.14	30.0	410,000	—30	NW.	43	7.5	18.2	0.3	400	20	720	63	14.4
Oct. 22, 1884	0.78	1,037,000	0.30	30.1	521,000	—23	NW.	42	3.3	3.9	0.3	350	30	420	63	4.6
Oct. 4, 1885	1.94	620,000	1.28	29.8	1,205,000	—23	NW.	43	4.6	7.0	0.8	900	30	920	65	12.9
Oct. 20, 1885	1.50	875,000	1.38	30.0	1,010,000	—23	NW.	39	3.4	3.6	0.8	1,000	30	540	63	7.4
Oct. 20, 1886			1.93	29.9	1,333,000	—27	NW.	44	5.0	5.6	0.6	1,000	30	530	58	6.8
Oct. 9, 1887	0.90	615,000	1.93	30.0	942,000	—20	N.	47	8.0	11.6	0.5	450	40	340	66	4.6
Oct. 12, 1887	5.95	1,831,000		30.0		—20	SW.	42	7.0	4.5					62	14.6
Oct. 23, 1887			1.46	30.0	1,118,000	—22		34	6.6						34	8.0
Oct. 24, 1887	2.36	754,000	0.98	29.9	726,000	—28	NW.	31	6.7	10.4	0.9	1,000	10	1,000	32	20.8
Oct. 2, 1888	0.66	385,000	3.21	29.9	1,358,000	—26	NW.	45	3.4	4.5	0.8	800	40	500	48	17.8
Oct. 19, 1888	1.27	462,000	0.43	29.9	562,000	—22	NW.	41	3.0	7.7	0.8	700	30	750	68	9.3
Oct. 16, 1886	4.61	1,466,009	1.99	30.0	710,000	—26	SW.	46	11.0	9.4					63	21.0
Nov. 7, 1880	0.59	555,000	0.94	30.0	779,000	—31	SW.	44	8.2	17.3	0.5	550	·20	850	67	14.0
Nov. 19, 1881	4.32	1,740,000	1.92	30.0	969,000	—42	NW.	32	29.0	96.1	0.7	1,050	—10	1,000	70	20.1
Nov. 20, 1881	7.08	1,802,000	0.42	30.0	415,000	—38	SW.	31	21.0	41.7	0.7	850	—10	1,150	66	16.8
Nov. 12, 1882	1.08	488,000	1.26	30.0	976,000	—46	NW.	36	13.0	34.7	0.7	1,050	0	960	70	23.5
Nov. 13, 1882	2.22	1,006,000		30.0		—32	SW.	24	8.6	23.5	0.5	500	—10	880	68	21.1
Nov. 14, 1882	2.49	938,000		30.0		—33	SW.	32	5.4	10.1	0.6	800	0	890	64	17.1
Nov. 24, 1882	2.36	988,000	0.50	30.0	452,000	—18	SW.	28	5.6	6.1	0.6	500	10	660	39	6.0
Nov. 6, 1883	0.65	387,000	1.69	30.0	892,000	—29	NW.	41	8.5	17.7	0.5	450	20	660	65	19.6

TABLE IX.—MEASURED EXTENTS OF "HIGHS" AND "LOWS" PRECEDING COLD WAVES, ETC.—Continued.

1	2	3	4	5		6	7	8	9	10	11		12			13
Date of cold wave.	Extent of high.	Area of high above isobar.	Extent of low.	Area of low below isobar.		Greatest fall of temperature.	Position of high center from low center.	Mean temperature in high and low area.	Excess of temperature above mean.	Isothermal number.	Difference of highest and lowest pressure and distance apart.		Highest and lowest temperature and distance apart.			Extent of cold wave.
				Isobar.	Area.						Difference.	Distance apart.	Lowest.	Distance apart.	Highest.	
		Sq. miles.			Sq. miles.	°		°	°				°	Miles.	°	
Nov. 7, 1883	2.79	1,094,000	0.20	30.0	148,000	—21	SW.	40	6.7	8.7	0.8	800	20	900	55	10.4
Nov. 10, 1883	0.17	395,000	1.06	29.9	647,000	—12	SW.	38	5.9	6.1	0.4	500	20	900	45	1.3
Nov. 12, 1883	3.51	1,202,000	------	30.0	------------	—29	NW.	35	7.5	11.7	0.9	700	0	1,100	63	20.2
Nov. 13, 1883	5.17	1,288,000	------	30.0	------------	—26	SW.	44	10.6	12.3	1.7	1,300	20	990	69	19.2
Nov. 15, 1883	2.37	889,000	------	30.0	------------	—23	SW.	28	6.0	4.3	0.9	1,000	10	860	49	7.8
Nov. 26, 1883	------	269,000	3.09	30.0	1,449,000	—52	L.	27	18.0	40.0	0.4	400	—20	1,050	38	30.9
Nov. 27, 1883	2.15	847,000	1.91	30.0	939,000	—30	SW.	25	16.2	37.6	0.9	800	—30	1,300	63	25.4
Nov. 5, 1884	2.06	984,000	0.29	30.1	294,000	—21	NW.	42	6.7	16.0	0.6	800	20	900	58	11.0
Nov. 6, 1884	4.00	1,350,000	------	------	------------	—21	------	35	5.4	------	1.0	900	30	350	54	6.7
Nov. 23, 1884	1.79	731,000	1.05	30.0	829,000	—40	N.	30	13.4	31.7	0.6	600	0	660	52	26.8
Nov. 24, 1884	1.50	644,000	2.55	30.0	1,049,000	—44	NW.	32	18.0	49.6	1.0	600	—20	960	56	31.5
Nov. 30, 1884	1.58	672,000	0.16	30.0	252,000	—11	NW.	28	3.7	4.4	0.5	600	10	800	38	5.6
Nov. 7, 1885	0.54	400,000	3.94	29.9	1,625,000	—29	SW.	43	10.3	11.7	0.6	700	30	480	64	6.3
Nov. 8, 1885	1.14	477,000	2.08	30.0	1,174,000	—23	SW.	43	11.7	15.7	0.8	700	20	900	63	12.4
Nov. 13, 1885	2.72	678,000	0.79	29.9	473,000	—34	SW.	36	8.7	21.3	0.9	900	10	660	63	27.5
Nov. 13, 1886	1.32	1,697,000	0.69	30.0	383,000	—28	NW.	30	12.4	17.0	0.6	500	10	950	60	6.8
Nov. 23, 1886	0.74	422,000	6.37	30.0	1,776,000	—41	N.	34	23.8	55.6	0.8	500	0	700	61	22.1
Nov. 18, 1886	2.61	980,000	2.36	30.0	997,000	—39	SW.	25	18.2	39.5	1.1	700	0	680	74	16.6
Nov. 26, 1886	0.22	264,000	0.57	30.0	5[illegible]8,000	—33	NW.	44	6.1	12.6	0.6	700	0	1,220	68	13.0
Nov. 20, 1887	0.65	445,000	3.97	30.0	1,011,000	—30	NW.	26	7.5	14.6	1.0	650	0	800	46	13.8
Nov. 23, 1887	0.82	444,000	1.85	30.0	865,000	—28	N.	29	9.8	17.5	0.6	650	0	900	28	12.2
Nov. 27, 1887	6.00	1,484,000	0.99	30.0	780,000	—42	N.	20	22.4	62.7	1.1	1,000	—30	1,070	32	36.5
Nov. 28, 1887	3.96	1,218,000	0.60	30.0	424,000	—58	SW.	21	19.2	74.9	0.8	600	—30	950	68	31.2

Nov. 9, 1888	*4.66*	*1,497,000*	*2.20*	*30.0*	*1,001,000*	*—24*	*NW.*	*41*	*17.7*	*15.7*	*0.9*	*700*	*20*	*670*	*68*	*7.8*
Nov. 12, 1889	*2.04*	*735,000*	*2.12*	*30.0*	*964,000*	*—18*	N.	38	19.0	12.7	0.7	600	0	710	40	14.2
Nov. 28, 1889	0.77	559,000	1.67	30.3	862,000	—24	SW.	32	8.7	15.3	0.7	600	—10	1,200	64	19.7
Dec. 9, 1880	3.05	1,092,000	0.41	30.0	1,092,000	—25	SW.	11	9.2	21.1	0.7	500	—20	1,000	36	9.8
Dec. 21, 1881	3.48	1,357,000	1.25	30.3	732,000	—22	NW.	34	14.2	18.9	0.6	450	20	600	54	5.8
Dec. 27, 1883	0.29	190,000	2.54	30.0	887,000	—45	NW.	19	11.2	36.4	0.6	600	—30	530	37	19.4
Dec. 13, 1884	4.79	1,695,000	0.06	30.0	52,000	—26	NW.	27	13.8	19.3	0.6	700	10	830	64	6.1
Dec. 31, 1884	3.55	1,233,000	0.83	30.1	952,000	—41	NW.	16	29.6	91.7	0.9	1,300	—30	850	64	20.7
Dec. 5, 1885	3.40	1,049,000	3.77	30.0	1,116,000	—35	NW.	35	10.8	18.7	1.2	700	10	700	50	34.8
Dec. 13, 1886	2.94	1,120,000	0.63	30.0	677,000	—18	SW.	31	7.3	6.1	0.7	800			55	2.7
Dec. 20, 1887	2.34	939,000	2.42	30.0	1,471,000	—48	SW.	26	18.3	35.4	0.8	600	—20	750	30	27.6
Dec. 21, 1887	7.81	1,743,000	1.32	30.0	1,743,000	—42	NW.	19	20.2	82.2	1.2	950	—10	440	42	21.2
Dec. 28, 1887	1.19	587,000	3.26	30.0	1,364,000	—42	N.	13	18.1	33.9	0.5	450	—20	1,000	32	21.3
Dec. 29, 1887	6.38	1,476,000	1.84	30.0	661,000	—32	NW.	10	22.7	54.6	1.1	600	—30	1,350	60	26.7
Dec. 25, 1888	1.00	600,000	1.55	30.0	1,142,000	—32	N.	30	15.0	38.3	0.5	500	0	480	52	9.5
Dec. 11, 1889	0.89	825,000	1.19	30.0	946,000	—26	SW.	38	12.8	24.0	0.4	400	0	900	62	18.1
Dec. 25, 1889	0.84	687,000	0.72	30.0	1,361,000	—34	NW.	29	11.8	28.2	0.6	400	—10	900	60	8.4
Dec. 29, 1889			3.80	30.0	2,399,000	—44	L.	38	12.3	20.0	0.7	800	10	780	24	28.1
Dec. 30, 1889	4.22	1,276,000	2.84	30.0	1,053,000	—44	NW.	25	23.7	93.2	1.2	600	—20	620	60	31.8
Jan. 12, 1880						—41		27	21.9		0.9	650	—20	800	51	
Jan. 21, 1880			1.78	30.0	1,219,000	—21	NW.	38	9.0	23.8	0.5	600	20	1,150	58	3.1
Jan. 15, 1881	2.14	907,000	1.41	30.0	671,000	—45	SW.	20	16.7	44.8	0.8	1,100	—20	790	37	26.7
Jan. 14, 1882	2.50	1,313,000	0.84	30.0	744,000	—35	NW.	19	12.4	26.2	0.6	450	—10	350	35	12.1
Jan. 17, 1882	3.92	1,220,000	6.00	30.0		—44	NW.	21	20.5	62.4	0.6	450	—20	1,050	60	59.9
Jan. 14, 1883	1.52	775,000	1.95	30.0	807,000	—34	NW.	22	13.0	34.3	1.2	700	—10	1,000	60	31.4
Jan. 18, 1883	1.87	1,008,000	0.48	30.0	482,000	—23	NW.	18	12.6	24.5	0.7	800	—20	800	28	28.8
Jan. 19, 1883	3.62	1,257,000	0.60	30.0	807,000	—38	N.	— 3	14.6	22.7			—30	620	22	12.5
Jan. 20, 1883	10.39	2,275,000	0.05	30.0	82,000	—45	NW.	4	30.2	69.8	0.8	700	—30	1,250	67	17.2
Jan. 6, 1884	11.02	2,243,000				—32	NW.	2	18.2	57.0	0.8	800	—30	1,100	40	10.4
Jan. 19, 1884	1.63	635,000				—41	NW.	16	5.3	18.9	0.7	650	—20	430	37	31.1
Jan. 1, 1885	5.44	1,836,000	3.04	30.1	1,116,000	—43	NW.	11	29.6	68.8	1.3	800	—40	1,300	48	43.6
Jan. 17, 1885	4.63	1,561,000	0.39	30.0	469,000	—45	NW.	14	26.8	68.2	0.6	550	—30	1,220	68	18.8
Jan. 18, 1885	5.75	1,211,000	4.36	30.0	1,145,000	—45	NW.	10	20.6	42.7	1.5	1,400	—30	1,320	70	26.3
Jan. 25, 1885	0.66	422,000	2.02	30.0	1,064,000	—31	NW.	14	10.9	22.1	0.5	500	—20	730	31	14.4
Jan. 9, 1886	4.82	1,288,000	1.48	30.0	665,000	—39	NW.	4	20.3	36.8	0.8	500	—30	1,100	47	16.4
Jan. 17, 1887	0.33	238,000	2.85	30.0	1,349,000	—42	NW.	25	12.0	36.2	0.7	900	—30	1,050	53	23.4
Jan. 18, 1887	7.17	1,667,000	2.96	30.0	1,006,000	—40	NW.	18	22.7	66.4	1.3	900	—30	1,300	58	34.2
Jan. 21, 1887			6.14	29.9	1,296,000	—40	L.	26	16.6	30.0	0.7	600	—10	540	37	16.4
Jan. 24, 1887	1.76	1,000,000	1.65	30.0	1,276,000	—29	SW.	30	19.3	45.8	0.7	950	—20	1,100	63	18.1

TABLE IX.—MEASURED EXTENTS OF "HIGHS" AND "LOWS" PRECEDING COLD WAVES, ETC.—Continued.

1	2	3	4	5		6	7	8	9	10	11		12			13
Date of cold wave.	Extent of high.	Area of high above isobar.	Extent of low.	Area of low below isobar.		Greatest fall of temperature.	Position of high center from low center.	Mean temperature in high and low area.	Excess of temperature above mean.	Isothermal number.	Difference of highest and lowest pressure and distance apart.		Highest and lowest temperature and distance apart.			Extent of cold wave.
				Isobar.	Area.						Difference.	Distance apart.	Lowest.	Distance apart.	Highest.	
		Sq. miles.			*Sq. miles.*	°		°	°				°	*Miles.*	°	
Jan. 30, 1887	0.07	84,000	2.07	30.0	905,000	—42	L.	10	9.5	20.0	0.8	700	—40	600	30	18.9
Jan. 1, 1888	0.92	634,000	3.88	30.0	1,358,000	—40	L.	19	18.2	40.0	0.8	650	—10	1,100	64	26.0
Jan. 8, 1888	5.13	1,616,000	1.54	30.0	1,006,000	—48	NW.	13	29.4	88.1	0.6	700	—30	1,000	68	27.7
Jan. 15, 1888	8.42	1,691,000	0.44	30.0	360,000	—44	N.	— 2	25.0	63.4	0.5	650	—40	1,100	48	23.8
Jan. 20, 1888	2.99	1,125,000	0.33	30.0	487,000	—42	NW.	—11	11.4	18.3	0.4	----	—40	1,100	34	12.2
Jan. 9, 1889	1.49	751,000	2.94	30.0	1,259,000	—26	NW.	29	14.1	22.6	0.7	750	0	900	56	19.9
Jan. 17, 1889	----	----	6.85	29.9	1,694,000	—32	L.	32	9.2	20.0	----	----	0	950	38	27.9
Feb. 29, 1880	0.87	443,000	1.12	30.0	863,000	—42	NW.	26	13.0	43.6	0.7	600	—10	670	62	19.6
Feb. 13, 1881	1.34	700,000	3.20	30.0	993,000	—31	NW.	24	11.8	19.6	1.1	700	—10	1,050	59	17.6
Feb. 21, 1882	3.28	1,556,000	0.47	30.0	445,000	—30	N.	18	18.4	42.1	0.6	700	—30	1,180	66	14.0
Feb. 4, 1883	4.89	1,720,000	0.30	30.1	474,000	—42	NW.	11	27.6	67.6	0.7	700	—30	1,130	68	16.8
Feb. 17, 1883	1.87	713,000	2.53	30.0	983,000	—60	NW.	21	21.3	72.4	1.0	800	—20	930	60	40.1
Feb. 25, 1883	2.71	1,263,000	1.03	30.0	766,000	—24	NW.	35	16.0	40.9	0.5	700	0	1,200	50	15.2
Feb. 6, 1884	0.49	539,000	2.10	30.0	1,260,000	—21	NW.	28	17.4	40.8	0.5	550	0	800	60	16.5
Feb. 20, 1884	0.55	663,000	1.81	30.0	845,000	—42	NW.	29	20.4	81.8	0.7	350	—38	1,250	45	33.6
Feb. 8, 1885	0.27	249,000	2.00	30.0	1,380,000	—22	L.	28	13.7	20.0	0.5	600	—20	950	36	16.0
Feb. 10, 1885	3.49	1,154,000	2.66	30.0	1,030,000	—44	NW.	12	19.2	91.6	1.3	1,100	—40	1,020	62	38.2
Feb. 16, 1885	0.71	732,000	1.46	30.0	1,084,000	—39	NW.	14	12.7	29.9	0.9	900	—20	700	40	13.9
Feb. 10, 1886	1.98	753,000	2.27	29.9	1,237,000	—20	NW.	33	12.6	15.5	0.7	600	10	900	51	11.4
Feb. 16, 1886	4.03	1,302,000	0.42	30.0	518,000	—33	NW.	22	16.6	32.2	0.7	550	—20	1,140	58	16.0
Feb. 26, 1886	1.50	823,000	4.77	30.0	1,496,000	—40	NW.	28	19.7	45.3	1.3	700	—20	800	33	28.9
Feb. 1, 1887	2.05	758,000	1.87	30.0	772,000	—40	N.	2	16.9	46.8	0.9	750	—30	900	45	7.5
Feb. 4, 1887	3.93	1,362,000	0.34	30.2	464,000	—42	N.	7	21.6	75.7	0.6	600	—40	1,330	67	23.4
Feb. 9, 1887	0.72	619,000	1.64	30.0	758,000	—38	NW.	26	20.5	38.0	0.6	600	—20	750	46	16.7

Feb. 11, 1887	*1.54*	*659,000*	*2.09*	*30.0*	*1,169,000*	*—54*	*N.*	*14*	*17.3*	*59.1*	*0.8*	*550*	*—30*	*820*	*63*	*26.8*
Feb. 12, 1887	3.69	1,316,000	3.24	30.0	970,000	—44	NW.	15	27.7	79.8	1.0	600	—30	1,100	63	38.2
Feb. 19, 1887	------	------	5.00	29.9	1,490,000	—25	L.	30	18.3	29.4	0.8	600	10	820	58	8.6
Feb. 25, 1887	3.87	1,258,000	1.82	30.0	615,000	—43	NW.	19	13.0	35.5	1.1	900	—30	1,130	50	20.1
Feb. 15, 1888	4.79	1,161,000	------	30.1	437,000	—42	NW.	13	16.9	39.0	1.0	1,000	—30	950	34	36.8
Feb. 16, 1888	5.80	2,076,000	------	30.4	------	—40	NW.	6	18.0	28.8	1.0	900	—20	700	38	16.2
Feb. 20, 1888	0.38	269,000	2.89	30.0	1,308,000	—27	L.	38	9.0	20.0	------	------	20	1,150	60	21.6
Feb. 26, 1888	------	------	5.94	30.0	1,569,000	—34	L.	32	13.0	20.0	0.8	500	—10	820	48	19.1
Feb. 6, 1889	2.49	934,000	2.89	30.0	975,000	—46	NW.	13	21.1	67.2	1.2	900	—40	850	36	20.1
Feb. 17, 1889	1.02	482,000	2.57	30.0	1,230,000	—30	NW.	29	17.6	43.9	0.8	800	—20	1,120	56	21.4
Feb. 23, 1889	3.31	949,000	4.00	30.4	------	—40	NW.	— 3	9.5	35.9	1.1	1,200	—30	640	32	31.5
Mar. 17, 1880	1.89	1,176,000	0.66	30.0	620,000	—26	NW.	24	16.4	21.9	0.4	500	0	900	61	3.5
Mar. 4, 1881	0.50	371,000	2.45	30.0	990,000	—30	SW.	34	10.2	18.3	0.7	450	10	1,000	58	7.8
Mar. 10, 1882	1.31	1,042,000	0.62	30.0	582,000	—21	NW.	36	11.0	18.2	0.6	800	10	750	64	3.7
Mar. 21, 1882	1.51	850,000	1.62	30.0	1,182,000	—30	NW.	35	18.4	43.7	0.7	700	0	820	66	21.1
Mar. 19, 1883	0.74	283,000	2.22	30.0	779,000	—38	NW.	24	10.9	31.5	0.9	600	—20	600	53	34.8
Mar. 12, 1884	------	------	5.04	30.0	1,911,000	—32	L.	35	15.7	38.7	0.9	800	—20	1,350	66	20.3
Mar. 17, 1885	1.90	728,000	1.69	30.0	1,016,000	—21	N.	11	13.2	29.5	0.8	900	—30	760	30	18.6
Mar. 10, 1886	2.61	1,154,000	0.64	30.0	617,000	—20	NW.	35	9.8	40.0	0.4	500	—10	820	50	12.3
Mar. 13, 1886	------	------	------	------	------	—15	------	------	------	------	------	------	.0	800	30	------
Mar. 21, 1886	------	------	5.13	30.0	1,728,000	—27	SW.	44	14.4	20.2	0.7	650	10	720	59	12.8
Mar. 3, 1887	1.42	545,000	1.74	30.0	823,000	—27	NW.	24	10.8	29.0	------	------	—10	800	60	15.6
Mar. 14, 1887	5.15	1,107,000	0.36	30.0	276,000	—30	NW.	27	8.4	15.6	1.2	800	—10	980	54	15.3
Mar. 3, 1888	3.10	1,050,000	0.89	30.2	498,000	—36	NW.	12	14.8	48.6	0.8	650	—20	900	60	22.4
Mar. 20, 1888	0.59	468,000	5.98	30.0	1,568,000	—40	NW.	34	13.4	18.3	0.7	500	10	740	56	19.9
Mar. 16, 1889	0.20	226,000	2.34	30.0	1,033,000	—32	NW.	34	13.5	16.0	0.6	500	0	600	54	2.7

It appears from an examination of this table that in a cold wave its extent is greater the greater the extent of the high and low areas of pressure and the greater the maximum fall of temperature. The maximum fall of temperature depends, as will be seen later, on the crowded condition of the isotherms. No matter how sparse the isotherms may be there will be some fall of temperature over the area of low pressure. This fall is greater the greater the contrast of temperature from the center of the low outward toward the west or northwest.

It will be necessary, therefore, to get some numerical expression for this contrast of temperature, which will be greater the greater the extent of country covered by the diminishing temperature and the closer the low temperature areas are to those of high temperature. If the distance between the high and low temperature is short it will, of course, render the areas between the isotherms small, and will cause the number expressing the character and extent of the temperature gradients also to be small.

Various suppositions can be made, according to which the isothermal number can be computed. The following was adopted as proving the most satisfactory for the greatest number of cases. For the various cold waves the value of this function is given in column 10 of Table IX.

On maps preceding great cold waves the areas between the various isothermal lines lie in strips from northeast to southwest. Their widths are relatively small as compared with their lengths. The widths may be from 50 to 100 miles, the lengths from 600 to 1,200 miles. In many cases the ensemble of isotherms is of a fan-shape, their least distances apart being in the vicinity of the low area of pressure, and gradually increasing towards the southwest and northeast. The isotherms are drawn for temperatures 10° apart.

Consider two contiguous-lying areas of temperature between three successive isotherms. The tendency is for the air from the places of low temperature to be carried to the places of high temperature. The mean temperature of one strip of country between two isotherms, as compared with another strip adjoining it, is 10° different. If the area of higher temperature is less in extent than the lower one, then there is a possibility, if all the air from the one of lower temperature overflows the one of higher temperature, that the fall of temperature will be equal in extent to the area of the higher one multiplied by their difference in temperature. The units adopted are the areas in hundreds of thousands of square miles and the difference of temperature expressed in tens of degrees. If the area of lower temperature is less in extent than the one of higher temperature it cannot possibly change the temperature of the higher one by more than its own area multiplied by the difference of temperature.

Consider a third area separated from the area of highest temperature by an area intermediate in temperature. Its effect on the higher temperature may be taken as proportional to its extent and the difference of temperature of the two areas. Its effect in lowering the temperature of the higher area will not, however, be as great as in the case of the contiguous area, as they are farther apart, and a portion of the lower temperature is expended in lowering the temperature of the intervening area. In like manner a fourth, fifth, sixth, etc., area of temperature will have its effect on the area of highest temperature proportional to the extent of the low and high area, the difference in temperature between them, and diminishing, according to some law, as their distance apart increases.

It is not known what this law is. There is some reason, however, for believing, as will appear farther on, that this law is nearly inversely as the distances of the centers of the areas apart. Accordingly, this will be adopted as the law, and two areas will be considered to have an effect on each other in lowering temperature proportional to the area of the lesser one and proportional to their difference in temperature and inversely as their distances apart expressed in hundreds of miles as the unit.

Taking the next area below the highest area and considering it with reference to all of the remaining areas below it, a certain extent of possible fall of temperature over its area will also be derived. Taking the third area and considering it with respect to those below it, in a similar manner, the effect on its area can be derived, and so on, until the last two areas are reached. The sums of the various sets of numbers, diminishing by one for each area until the last two are reached, will give a total, which is that contained in column 10 of Table IX, and which is a function of the areas between the isothermal lines and their distances apart. This number expresses the possibility of a temperature fall over an area due to the conditions of the isotherms.

To recapitulate, this number is computed as follows: The whole possible effect of two contiguous areas in producing a temperature fall is taken as the area of the smaller one in hundreds of thousands of square miles multiplied by unity, and divided by the distance of the areas apart in hundreds of miles except when the distance is less than 100 miles. In such a case the divisor is always unity. The possible effect of the third area on the highest area is taken to be as the smaller area of the two, expressed in hundreds of thousands of square miles, multiplied by two, the difference of the temperatures being 20°, and divided by the distance in hundreds of miles from the highest isotherm to the center of the third area along the lines of least distance from the highest to the lowest isotherm.

The whole possible effect of a fourth area on the highest area, is taken as proportional to the area of the smaller of the two, multiplied by three, and divided by the distance of the center of area from the highest isotherm. An example of the method of computation is given below, for the cold waves of February 12, 1887.

WEATHER MAP OF FEBRUARY 11, 1887.

Areas between isotherms (square miles).			Distances of isotherms apart in 100's of miles.			Distances from centers of areas to highest isotherms.
—30° to	—20°	213,300	—30° to	60°	11.0	9.5
—20	—10	168,000	—20	60	8.0	7.4
—10	0	188,000	—10	60	6.9	6.0
0	10	404,000	0	60	5.0	4.4
10	20	275,000	10	60	3.8	3.2
20	30	281,000	20	60	2.7	2.4
30	40	175,000	30	60	2.1	1.8
40	50	121,000	40	60	1.5	1.2
50	60	142,000	50	60	0.8	0.4
60	+	234,000	60			

FEBRUARY 11, 1887.—COMPUTATION OF ISOTHERMAL NUMBER.

$1.4\times1\times1=1.4$	$1.2\times1\times1=1.2$	$1.2\times1\times1=1.2$
$1.2\times2\times1=2.4$	$1.4\times2\times\frac{1}{1.4}=2.0$	$1.2\times2\times1=2.4$
$1.8\times3\times\frac{1}{2}=2.7$	$1.4\times3\times\frac{1}{2}=2.1$	$1.2\times3\times\frac{1}{2}=1.8$
$2.3\times4\times\frac{1}{2.4}=3.7$	$1.4\times3\times\frac{1}{2.8}=1.4$	$1.2\times4\times\frac{1}{3}=1.6$
$2.3\times5\times\frac{1}{3}=3.8$	$1.4\times4\times\frac{1}{4}=1.4$	$1.2\times5\times\frac{1}{5}=1.2$
$2.3\times6\times\frac{1}{4.4}=3.1$	$1.4\times5\times\frac{1}{5.6}=1.3$	$1.2\times6\times\frac{1}{6}=1.2$
$1.9\times7\times\frac{1}{6}=2.2$	$1.4\times6\times\frac{1}{7}=1.2$	$1.2\times7\times\frac{1}{8}=1.0$
$1.7\times8\times\frac{1}{7.4}=1.9$	$1.4\times7\times\frac{1}{9}=1.1$	
$2.1\times9\times\frac{1}{9.5}=1.9$		
23.1	11.7	10.4
$1.8\times1\times1=1.8$	$2.8\times1\times1=2.8$	$2.7\times1\times1=2.7$
$1.8\times2\times\frac{1}{1.5}=2.4$	$2.8\times2\times\frac{1}{2}=2.8$	$1.9\times2\times\frac{1}{3}=1.3$
$1.8\times3\times\frac{1}{2.5}=2.2$	$1.9\times3\times\frac{1}{3.5}=1.6$	$1.7\times3\times\frac{1}{4}=1.3$
$1.8\times4\times\frac{1}{4}=1.8$	$1.7\times4\times\frac{1}{5}=1.3$	$2.1\times4\times\frac{1}{6}=1.4$
$1.7\times5\times\frac{1}{6}=1.4$	$2.1\times5\times\frac{1}{7}=1.5$	
$1.8\times6\times\frac{1}{8}=1.3$		
10.9	10.0	6.7
$1.9\times1\times\frac{1}{1.5}=1.3$	$1.7\times1\times\frac{1}{1.5}=1.1$	$1.7\times1\times\frac{1}{2}=0.8$
$1.7\times2\times\frac{1}{3}=1.1$	$1.9\times2\times\frac{1}{3}=1.3$	
$2.1\times3\times\frac{1}{5}=1.3$		
3.7	2.4	0.8

Total 79.7.

It was imagined, to begin with, that the extent of fall of temperature in a cold wave might be proportional to the sum of the products of the extent of the areas of low pressure and high pressure respectively into the isothermal number and an unknown factor. Observation equations were made on this supposition. The normal equations were formed according to the method of least squares and solved for the values of the unknown quantities. The residuals of the observation equations were small in the case of the large cold waves, but in the case of the cold waves of small extent the residuals were very large. The solution showed that some part of the extent of a cold wave must be due to the simple action of the low-pressure area without regard to the density or sparseness of the isothermal lines throughout it.

It is assumed that the extent of temperature fall in a cold wave is composed of two parts. One part is due to the convective intermixture of the air from the surface of the earth to a great height in the atmosphere, caused by the action of the high and low pressure in the production of winds, and another to the progress of air from the northwest where the temperature is low towards the southeast where the temperature is high. Accordingly on this supposition equations were again formed in which the extent of the cold wave was placed equal to the extent of low pressure and high pressure multiplied by unknown factors and also the extent of low and high areas multiplied by the isothermal number and two other unknown factors.

This solution showed that there could not be any considerable part of the extent of a cold wave due to the product of the extent of high pressure into the isothermal number and a factor. When the term expressing this was omitted, the solution became more satisfactory and the residuals made a better showing, not being dependent, as before, on the extent of the cold wave.

This would seem to indicate that the supposition is approximately correct that the extent of a cold wave is composed of three principal parts, one due to the mere extent of the area of low pressure, another to the extent of the area of high pressure, and a third part due to the product of the extent of area of low pressure into the isothermal number. This is taken to indicate that the cooling of air in the area of high pressure is due mostly to the convective intermixture of air at high and low levels, while in the case of the low-pressure area the fall of temperature is due both to the convective intermixture of air and also to the progress of the air induced by the circulation of the winds around a low area blowing from the northwest to the southeast on the west side of the low.

In the case of most cold waves the isothermal lines are relatively much spread out in the area of high pressure on the map preceding the cold wave. The high area in fact marks the region where a cold wave is prevailing. In some instances a part of the area of high pressure is covered with isotherms close together. A scrutiny of the residuals of the observation-equations in these cases shows that the addition to the extent of the cold wave of a small term depending on the extent of the area of high pressure so covered into the isothermal number would improve the residuals.

The equation expressing the relation between extent of temperature-fall and extent of high and low pressure areas will be taken of the form;

$Hh + Ll + Ll_1 F =$ extent of temperature fall.

The factors h, l, and l_1 are to be determined from observed cold waves.

H, L, and F are the measured extents of the high-pressure area, the low-pressure area, and the isothermal number.

The observation-equations are given below. The first term expresses the effect of the high area of pressure, the second the effect of the low-pressure area, and the third the effect due to the product of the extent of area of low pressure into one-tenth of the isothermal number, as given in column 10 of Table IX. The absolute term is the extent of the cold wave. On the other side of the equality signs the residuals are given. The equations are in three groups, corresponding to the positions of the area of high pressures, with respect to the low pressures, whether to the northwest or southwest or without any high area. These groups having shown no marked differences the solution was made as a whole.

OBSERVATION-EQUATIONS.

First group.	High pressure to the northwest of low pressure.				Residuals. Comp. — observed.
Oct. 16, 1882	$0.0h$	$+1.1l$	$+0.6l_1$	$-10=V_1$	-6
Oct. 8, 1884	$1.4h$	$+0.1l$	$+0.2l_1$	$-14=$	-0
Oct. 22, 1884	$0.8h$	$+0.3l$	$+0.0l_1$	$-5=$	-2
Oct. 4, 1885	$1.9h$	$+1.3l$	$+0.9l_1$	$-13=$	-3
Oct. 20, 1885	$1.5h$	$+1.4l$	$+0.6l_1$	$-7=$	$+2$
Oct. 20, 1886	$0.0h$	$+1.9l$	$+1.0l_1$	$-7=$	0
Oct. 9, 1887	$0.9h$	$+1.9l$	$+2.2l_1$	$-5=$	$+5$
Oct. 24, 1887	$2.4h$	$+1.0l$	$+1.0l_1$	$-21=$	-11
Oct. 2, 1888	$0.7h$	$+3.2l$	$+1.6l_1$	$-18=$	-5
Oct. 19, 1888	$1.3h$	$+0.4l$	$+0.3l_1$	$-9=$	-4
Nov. 19, 1881	$4.3h$	$+1.9l$	$+18.2l_1$	$-20=$	$+8$
Nov. 12, 1882	$1.1h$	$+1.3l$	$+4.6l_1$	$-24=$	-14
Nov. 6, 1883	$0.7h$	$+1.7l$	$+3.1l_1$	$-20=$	-11
Nov. 12, 1883	$3.5h$	$+0.0l$	$+3.1l_1$	$-20=$	-9
Nov. 5, 1884	$2.1h$	$+0.3l$	$+0.5l_1$	$-11=$	-4
Nov. 23, 1884	$1.8h$	$+1.1l$	$+3.5l_1$	$-27=$	-17
Nov. 24, 1884	$1.5h$	$+2.6l$	$+13.0l_1$	$-32=$	-13
Nov. 30, 1884	$1.6h$	$+0.2l$	$+0.1l_1$	$-6=$	-1
Nov. 13, 1886	$1.3h$	$+0.7l$	$+1.2l_1$	$-7=$	0
Nov. 23, 1886	$0.7h$	$+6.4l$	$+35.8l_1$	$-22=$	$+20$
Nov. 26, 1886	$0.2h$	$+0.6l$	$+7.8l_1$	$-13=$	-6
Nov. 20, 1887	$0.7h$	$+4.0l$	$+6.0l_1$	$-14=$	$+4$
Nov. 23, 1887	$0.8h$	$+1.8l$	$+3.2l_1$	$-12=$	-2
Nov. 27, 1887	$6.0h$	$+1.0l$	$+6.3l_1$	$-36=$	-13
Nov. 9, 1888	$4.7h$	$+2.2l$	$+3.5l_1$	$-8=$	$+14$
Nov. 12, 1889	$2.0h$	$+2.1l$	$+2.7l_1$	$-14=$	0
Dec. 21, 1881	$3.5h$	$+1.2l$	$+2.3l_1$	$-6=$	$+9$
Dec. 27, 1883	$0.3h$	$+2.5l$	$+9.0l_1$	$-19=$	-5
Dec. 13, 1884	$4.8h$	$+0.1l$	$+0.2l_1$	$-6=$	$+8$
Dec. 31, 1884	$3.6h$	$+0.8l$	$+7.4l_1$	$-21=$	-5
Dec. 5, 1885	$3.4h$	$+3.8l$	$+7.2l_1$	$-35=$	-10
Dec. 21, 1887	$7.8h$	$+1.3l$	$+10.7l_1$	$-21=$	$+11$
Dec. 28, 1887	$1.2h$	$+3.3l$	$+11.2l_1$	$-21=$	-1
Dec. 29, 1887	$6.4h$	$+1.8l$	$+9.9l_1$	$-27=$	$+2$
Dec. 25, 1888	$1.0h$	$+1.6l$	$+6.1l_1$	$-10=$	$+1$
Dec. 25, 1889	$0.8h$	$+0.7l$	$+2.0l_1$	$-8=$	$+2$
Dec. 30, 1889	$4.2h$	$+2.8l$	$+26.0l_1$	$-32=$	$+2$
Jan. 14, 1882	$2.5h$	$+0.8l$	$+2.1l_1$	$-12=$	-1
Jan. 17, 1882	$3.9h$	$+6.0l$	$+37.2l_1$	$-60=$	-10
Jan. 14, 1883	$1.5h$	$+2.0l$	$+6.8l_1$	$-31=$	-17
Jan. 18, 1883	$1.9h$	$+0.5l$	$+1.2l_1$	$-29=$	-21
Jan. 19, 1883	$3.6h$	$+0.6l$	$+1.4l_1$	$-12=$	$+1$
Jan. 20, 1883	$10.4h$	$+0.1l$	$+0.7l_1$	$-17=$	$+12$
Jan. 6, 1884	$11.0h$	$+0.0l$	$+0.0l_1$	$-10=$	$+20$
Jan. 1, 1885	$5.4h$	$+3.0l$	$+20.7l_1$	$-44=$	-8
Jan. 17, 1885	$4.6h$	$+0.4l$	$+2.7l_1$	$-19=$	-3
Jan. 18, 1885	$5.8h$	$+4.4l$	$+18.9l_1$	$-26=$	$+14$
Jan. 25, 1885	$0.7h$	$+2.0l$	$+4.0l_1$	$-14=$	-4
Jan. 9, 1886	$4.8h$	$+1.5l$	$+5.6l_1$	$-16=$	$+5$
Jan. 17, 1887	$0.3h$	$+2.8l$	$+10.1l_1$	$-23=$	-8
Jan. 18, 1887	$7.2h$	$+3.0l$	$+19.8l_1$	$-34=$	$+6$
Jan. 8, 1888	$5.1h$	$+1.5l$	$+13.2l_1$	$-28=$	$+1$
Jan. 15, 1888	$8.4h$	$+0.4l$	$+2.5l_1$	$-24=$	$+2$
Jan. 20, 1888	$3.0h$	$+0.3l$	$+0.5l_1$	$-12=$	-3
Jan. 9, 1889	$1.5h$	$+2.9l$	$+6.7l_1$	$-20=$	-3
Feb. 29, 1880	$0.9h$	$+1.1l$	$+4.8l_1$	$-20=$	-11
Feb. 13, 1881	$1.3h$	$+3.2l$	$+6.4l_1$	$-18=$	-1
Feb. 21, 1882	$3.3h$	$+0.5l$	$+2.1l_1$	$-14=$	-2
Feb. 4, 1883	$4.9h$	$+0.3l$	$+2.0l_1$	$-17=$	-1
Feb. 17, 1883	$1.9h$	$+2.5l$	$+18.0l_1$	$-40=$	-17

OBSERVATION-EQUATIONS—Continued.

First group.	High pressure to the northwest of low pressure.				Residuals Comp.—observed.
Feb. 25, 1883	$2.7h$	$+1.0l$	$+4.1l_1$	$-15=V_1$	-2
Feb. 6, 1884	$0.5h$	$+2.1l$	$+8.6l_1$	$-16=$	-5
Feb. 20, 1884	$0.6h$	$+1.8l$	$+14.8l_1$	$-34=$	-18
Feb. 10, 1885	$3.5h$	$+2.7l$	$+24.8l_1$	$-38=$	-6
Feb. 16, 1885	$0.7h$	$+1.5l$	$+4.5l_1$	$-14=$	-5
Feb. 10, 1886	$2.0h$	$+2.3l$	$+3.7l_1$	$-11=$	-1
Feb. 16, 1886	$4.0h$	$+0.4l$	$+1.3l_1$	$-16=$	-3
Feb. 26, 1886	$1.5h$	$+4.8l$	$+21.6l_1$	$-29=$	$+2$
Feb. 1, 1887	$2.0h$	$+1.9l$	$+8.9l_1$	$-8=$	$+8$
Feb. 4, 1887	$3.9h$	$+0.3l$	$+2.3l_1$	$-23=$	-10
Feb. 9, 1887	$0.7h$	$+1.6l$	$+6.1l_1$	$-17=$	-7
Feb. 11, 1887	$1.5h$	$+2.1l$	$+12.4l_1$	$-27=$	-9
Feb. 12, 1887	$3.7h$	$+3.2l$	$+25.9l_1$	$-38=$	-4
Feb. 19, 1887	$0.0h$	$+5.0l$	$+14.5l_1$	$-9=$	$+15$
Feb. 25, 1887	$3.9h$	$+1.8l$	$+6.5l_1$	$-20=$	0
Dec. 15, 1888	$4.8h$	$+4.0l$	$+16.6l_1$	$-37=$	-2
Dec. 16, 1888	$5.8h$	$+0.0l$	$+0.0l_1$	$-16=$	0
Dec. 6, 1889	$2.5h$	$+2.9l$	$+19.4l_1$	$-20=$	$+7$
Dec. 17, 1889	$1.0h$	$+2.6l$	$+11.4l_1$	$-21=$	-4
Dec. 23, 1889	$3.3h$	$+4.0l$	$+14.0l_1$	$-31=$	-2
Mar. 17, 1880	$1.9h$	$+0.7l$	$+1.5l_1$	$-4=$	$+4$
Mar. 10, 1882	$1.3h$	$+0.6l$	$+1.1l_1$	$-4=$	$+2$
Mar. 21, 1882	$1.5h$	$+1.6l$	$+7.0l_1$	$-21=$	-8
Mar. 17, 1885	$1.9h$	$+1.7l$	$+5.1l_1$	$-19=$	-6
Mar. 10, 1886	$2.6h$	$+0.6l$	$+2.4l_1$	$-12=$	-2
Mar. 3, 1887	$1.4h$	$+1.7l$	$+4.9l_1$	$-16=$	-4
Mar. 14, 1887	$5.2h$	$+0.4l$	$+0.6l_1$	$-15=$	$+1$
Mar. 3, 1888	$3.1h$	$+0.9l$	$+4.5l_1$	$-22=$	-8
Mar. 20, 1888	$0.6h$	$+6.0l$	$+10.8l_1$	$-20=$	$+6$
Mar. 16, 1889	$0.2h$	$+2.3l$	$+3.7l_1$	$-3=$	$+7$

Second group.	High pressure southwest of low pressure.				Residuals. Comp.—observed.
Oct. 16, 1886	$4.0h$	$+2.0l$	$+1.8l_1$	$-21=$	-3
Oct. 12, 1887	$6.0h$	$+0.0l$	$+0.0l_1$	$-15=$	$+1$
Nov. 7, 1880	$0.6h$	$+0.9l$	$+1.5l_1$	$-14=$	-9
Nov. 20, 1881	$7.1h$	$+0.4l$	$+1.7l_1$	$-17=$	$+5$
Nov. 13, 1882	$2.2h$	$+0.0l$	$+0.0l_1$	$-21=$	-15
Nov. 14, 1882	$2.5h$	$+0.0l$	$+0.0l_1$	$-17=$	-10
Nov. 24, 1882	$2.4h$	$+0.5l$	$+0.3l_1$	$-6=$	$+2$
Nov. 7, 1883	$2.8h$	$+0.2l$	$+0.2l_1$	$-10=$	-2
Nov. 10, 1883	$0.2h$	$+1.1l$	$+0.7l_1$	$-1=$	$+3$
Nov. 13, 1883	$5.2h$	$+5.4l$	$+6.5l_1$	$-19=$	$+16$
Nov. 15, 1883	$2.4h$	$+0.0l$	$+0.0l_1$	-8	-1
Nov. 27, 1883	$2.2h$	$+1.9l$	$+7.2l_1$	$-25=$	-9
Nov. 7, 1885	$0.5h$	$+3.9l$	$+4.7l_1$	$-6=$	$+10$
Nov. 8, 1885	$1.1h$	$+2.1l$	$+3.4l_1$	$-12=$	-1
Nov. 13, 1885	$2.7h$	$+0.8l$	$+1.7l_1$	$-28=$	-17
Nov. 18, 1886	$2.6h$	$+2.4l$	$+9.6l_1$	$-17=$	$+3$
Nov. 28, 1887	$4.0h$	$+0.6l$	$+4.5l_1$	$-31=$	-16
Dec. 9, 1880	$3.0h$	$+0.4l$	$+0.8l_1$	$-10=$	0
Dec. 13, 1886	$2.9h$	$+0.6l$	$+0.4l_1$	$-3=$	$+7$
Dec. 20, 1887	$2.3h$	$+2.4l$	$+8.4l_1$	$-28=$	-10
Dec. 11, 1889	$0.9h$	$+1.2l$	$+2.9l_1$	$-18=$	-10
Jan. 15, 1881	$2.1h$	$+1.4l$	$+6.3l_1$	$-27=$	-13
Jan. 24, 1887	$1.8h$	$+1.7l$	$+7.8l_1$	$-18=$	-3
Mar. 4, 1881	$0.5h$	$+2.4l$	$+4.3l_1$	$-8=$	$+3$
Mar. 21, 1886	$0.0h$	$+5.1l$	$+10.2l_1$	$-13=$	$+9$

OBSERVATION—EQUATIONS—Continued.

Third group.	Low areas of pressure with small areas of high pressure.				Residuals. Comp.—observed.
Nov. 26, 1883	$0.0h$	$+3.1l$	$+12.4l_1$	$-31=$	-14
Dec. 29, 1889	$0.0h$	$+3.8l$	$+7.6l_1$	$-28=$	-12
Jan. 21, 1887	$0.0h$	$+6.1l$	$+18.0l_1$	$-16=$	$+13$
Jan. 30, 1887	$0.0h$	$+2.1l$	$+4.0l_1$	$-19=$	-10
Jan. 1, 1888	$0.9h$	$+3.9l$	$+15.6l_1$	$-26=$	-3
Jan. 17, 1889	$0.0h$	$+6.8l$	$+13.6l_1$	$-28=$	$+1$
Feb. 8, 1885	$0.3h$	$+2.0l$	$+4.0l_1$	$-16=$	-7
Feb. 19, 1887	$0.0h$	$+5.0l$	$+14.7l_1$	$-9=$	$+15$
Feb. 20, 1888	$0.4h$	$+6.0l$	$+5.8l_1$	$-22=$	$+1$
Feb. 26, 1888	$0.0h$	$+5.9l$	$+11.8l_1$	$-19=$	$+6$
Mar. 12, 1884	$0.0h$	$+5.0l$	$+19.5l_1$	$-20=$	$+6$

The normal equations from these are:

$$\begin{aligned} (1347h) + 442l + 2001l_1 - 6192 &= 0 \\ 442h + (842l) + 2829l_1 - 5411 &= 0 \\ 2001h + 2829l + (12800l_1) - 21410 &= 0 \end{aligned}$$

The solution of these gives—

$$h = 2.75$$
$$l = 3.15$$
$$l_1 = 0.547$$

The substitution of these values of the factors gives the residuals as above.

The probable error of a computed extent of cold wave as derived from the above residuals is ± 5.4.

The formula then for computing the extent of cold wave is as follows:

$$2.75\ \mathrm{H} + 3.15\ \mathrm{L} + 0.547\ \mathrm{L\,F} = \text{extent of cold wave},$$

H and L being the extent of high and low area and F one-tenth of the isothermal number.

The results of this computation are not on the whole very bad, although the residuals are by no means entirely satisfactory. The values found for the factors h, l, and l_1 will however be adopted, as some methodical plan for the forecasting of cold waves is necessary.

An examination of the maps preceding the cold waves, in connection with these residuals, shows the necessity of taking into account not only the extent of pressure over the areas of high and low pressure, but also their relative positions with respect to the areas of low and high temperature. Improvements can doubtless be made by the addition of terms expressive of varying pressure gradients throughout the areas of high and low. The method of expressing the isothermal number gives a good result and is quite satisfactory for cases where the areas between isotherms are long, narrow strips on the map, extending from southwest to northeast at nearly equal distances apart. This is the most important case in the occurrence of cold waves. Under such circumstances the cold waves are usually large. This does not do well, however, for a type of isotherm like that of December 20, 1881, where the isotherms are spread out fan-shaped on both sides of the greatest temperature gradient spreading on one side towards the northeast, and on the other side towards the southwest from a line joining the center of the low with the center of the high.

To improve this method of deriving the extent of temperature fall in a prospective cold wave one supposition and then another can be tried until something is found that gives a more satisfactory set of residuals. In the five trials that were made before the adoption of the method given above, there was a constant improvement in the residuals. It is thought that a great improvement can be made by a separation of the effects due to the excess or defect of pressure above or below certain isobars, instead of putting in the pressure effects of the high and low each as a whole, as has been done in the method adopted.

The various methods tried seem to indicate that the extent of temperature fall, due to the high area of pressure, is caused by the intermixture of upper and lower air. The high area has only a limited power to cause temperature-fall to the southeast of it, as compared with an equal extent of pressure deficiency in a low area. A very considerable part of the excess of pressure in a high area is the result of the low temperature within its borders.

This method of determining the extent of a cold wave is open to the objection that the extent of a temperature-fall in a cold wave, if viewed as the result of a certain phase of isobar or isotherm, may not have produced its entire effect after the lapse of twenty-four hours. Moreover, any phase of isobar as it occurs at 7 a. m. must have existed for some time previously, even if only for a few hours, and consequently it must have had its effect in producing temperature-fall during that time. The method adopted of measuring the extent of temperature-fall may then have given a result too low. But for the average of cases it is presumed the error will not be great.

The presence of a large area of temperature-fall on a map, coincident with a phase of isobar favorable to a prospective fall of temperature, is one of the best indications that the fall may be expected to continue. But what part of the extent of fall already achieved is due to the current phase of isobar it is impossible to determine.

MAXIMUM FALL OF TEMPERATURE IN A COLD WAVE.

An examination of the weather maps in 217 cases preceding cold waves shows that the greatest fall of temperature occurred in 134 cases within the lowest isobars of the low area within about 75 or 100 miles of the actual center of low pressure. In 62 cases the maximum fall was south of center of low area 200 miles or more; in 8 cases it was north of center; in 4 cases, west of center; in 3 cases, east of center; and in 6 cases so remote from center as to have no apparent connection with it.

In at least 80 per cent. of the cases of all cold waves the place of maximum fall of temperature can be located beforehand some place within 100 miles of its true place by taking it at the place of highest temperature within a distance of 100 miles of the center of the low pressure, near the place of greatest temperature gradient, near the turning points or crests of the highest isotherms, or in the mean of the position of these three places.

The magnitude of the maximum temperature-fall in a cold wave is conspicuously dependent on the magnitude of the temperature gradient on the weather map preceding it. Of the various methods tried for determining the amount of fall the following was found to be the best:

Draw a line from the selected point of greatest prospective fall of temperature perpendicular to the isotherms where they are closest together on the map preceding the cold wave. Measure the distance from each isotherm to the place of greatest fall. This line will be composed of a series of sections included between the isotherms. The temperature at the place of greatest temperature-fall, after the cold wave prevails, will be the weighted mean of the mean temperature along the various sections of the line, the weights being directly as the lengths of the sections and inversely as the distances from the center of the sections to the point of greatest fall. The mean of the highest temperature, or temperature at point of greatest prospective fall of temperature, and of the temperature at the first isotherm taken into account is given a weight of one. The mean temperature of a section is the mean of its bounding isotherms. Only the isotherms beyond a distance of 200 miles from the point of greatest prospective fall are taken into account in forming this mean.

The following is an example of the computation of the greatest fall of temperature in the cold wave of February 12, 1887: On the weather map of February 11 the distances from the point of greatest temperature-fall on the day following to the various isotherms were as follows: Columbus, Ohio, temperature, 63°; distance to the —30° isotherm, 1,100 miles; to the —20° isotherm, 800 miles; to the —10° isotherm, 690; to the 0° isotherm, 500; to the 10° isotherm, 380; to the 20° isotherm, 270. The lengths of the various sections, their mean temperatures, and distances of centers from the point of highest temperature are as follows:

FEBRUARY 11, 1887.

Distances between isotherms.	Mean temperature of section.	Length of section.	Center of section from point of greatest fall.	Assigned weight.	Mean temp. × weight.
° ° *Miles.*		*Miles.*	*Miles.*		
—30 to 60, 1,100					
—20 to 60, 800	—25°	300	950	.32	—8.0
10 to 60, 690	—15°	110	750	.15	—2.2
0 to 60, 500	— 5	190	590	.32	—1.6
10 to 60, 380	5	120	440	.27	+1.4
20 to 60, 270	15	110	360	.31	+4.7
(20-63)	42			1.00	42.
Sums				2.37	36.3
Mean temperature					15.3
Fall of temperature					—47.7

In Table X, the computed and observed greatest temperature-falls are given for a great many cold waves.

Column 1 gives the date of the occurrence of low temperature; column 2 gives the place of greatest fall; column 3 gives the high temperature at the place of greatest fall; column 4 gives the observed greatest fall; column 5 gives the computed fall of temperature; column 6 gives the extent of temperature-fall in cold wave, including allowance for all fall of temperature inclosed by the 10° temperature-fall line.

It is worthy of note that the temperature at place of greatest fall as computed by the method described is very nearly the mean temperature throughout the area of high and low pressure. This mean is given in column 8 of Table IX.

TABLE X.—COMPARISON OF OBSERVED AND COMPUTED GREATEST TEMPERATURE-FALLS IN COLD WAVES.

Date.	Place.	Temperature.	Observed temperature-fall.	Computed temperature-fall.	Observed extent of cold wave.
		°	°	°	°
Oct. 4, 1882	Detroit, Mich	65	—23	—20	12.3
Oct. 16, 1882	Yankton, S. Dak	62	—27	—26	9.7
Oct. 15, 1883	Boston, Mass	71	—29	—30	10.7
Oct. 8, 1884	Dodge City, Kans	63	—30	—28	14.4
Oct. 22, 1884	Keokuk, Iowa	63	—23	—21	4.6
Oct. 20, 1885		63	—23	—25	7.4
Oct. 15, 1886	Minnedosa, Man	59	—23		20.3
Oct. 16, 1886	Boston, Mass	65	—26	—20	21.0
Oct. 20, 1886	North Platte, Nebr	58	—27	—25	6.8
Oct. 9, 1887	Concordia, Kans	64	—20	—25	4.6
Oct. 23, 1887	Fort Custer, Mont	34	—22		8.0
Oct. 2, 1888	Rapid City, S. Dak	60	—28	—17	17.8
Oct. 19, 1888	Concordia, Kans	62	—28	—25	9.3
Nov. 7, 1880	Montgomery, Ala	67	—31	—37	14.0
Nov. 19, 1881	Denison, Tex	70	—42	—41	20.1
Nov. 20, 1881	Knoxville, Tenn	66	—38	—33	16.8
Nov. 12, 1882	Fort Elliott, Tex	70	—46	—35	24.1
Nov. 13, 1882	Shreveport, La	68	—32	—41	21.1
Nov. 14, 1882	Atlanta, Ga	64	—33	—30	16.2
Nov. 24, 1882	Chicago, Ill	39	—18	—10	6.0
Nov. 6, 1883	Kansas City, Mo	65	—29	—25	19.6
Nov. 7, 1883	Columbus, Ohio	55	—21	—21	10.4
Nov. 10, 1883	Alpena, Mich	45	—12	—10	1.3

TABLE X.—COMPARISON OF OBSERVED AND COMPUTED GREATEST TEMPERATURE-FALLS IN COLD WAVES—Continued.

Date.	Place.	Temperature.	Observed temperature-fall.	Computed temperature-fall.	Observed extent of cold wave.
		°	°	°	°
Nov. 12, 1883	Nashville, Tenn	63	—29	—23	20.2
Nov. 13, 1883	Savannah, Ga	69	—26	—26	19.2
Nov. 15, 1883	Lynchburg, Va	49	—23	—17	7.8
Nov. 27, 1883	Louisville, Ky	63	—30	—42	25.4
Nov. 5, 1884	do	58	—21	—16	11.0
Nov. 6, 1884	Boston, Mass	54	—21		6.7
Nov. 23, 1884	Kansas City, Mo	52	—40	—22	26.8
Nov. 24, 1884	Indianapolis, Ind	56	—44	—32	31.5
Nov. 30, 1884	Dodge City, Kans	38	—11	— 8	5.6
Nov. 7, 1885	Lamar, Mo	64	—29	—18	6.3
Nov. 8, 1885	Columbus, Ohio	63	—23	—20	12.4
Nov. 13, 1885	Fort Smith, Ark	63	—34	—27	27.5
Nov. 13, 1886	Chattanooga, Tenn	60	—28	—22	6.8
Nov. 18, 1886	New Orleans, La	74	—39	—45	16.6
Nov. 23, 1886	Kansas City, Mo	61	—41	—28	22.1
Nov. 26, 1886	Charleston, S. C	68	—33	—31	13.0
Nov. 20, 1887	St. Louis, Mo	46	—30	—25	13.8
Nov. 23, 1887	Fort Sully, S. Dak	28	—28	—17	12.2
Nov. 27, 1887	Concordia, Kans	32	—42	—43	36.5
Nov. 28, 1887	Cincinnati, Ohio	68	—58	—55	31.2
Nov. 9, 1888	Vicksburg, Miss	68	—24	—26	7.8
Nov. 12, 1889	Fort Elliott, Tex	40	—18	—16	14.2
Nov. 28, 1889	Mobile, Ala	64	—24	—34	19.7
Dec. 9, 1880	Louisville, Ky	36	—25	—28	9.8
Dec. 21, 1881	Denison, Tex	54	—22	—14	5.8
Dec. 27, 1883	Des Moines, Iowa	37	—45	—36	19.4
Dec. 13, 1884	Atlanta, Ga	64	—26	—32	6.1
Dec. 31, 1884	Palestine, Tex	64	—41	—48	20.7
Dec. 5, 1885	Kansas City, Mo	50	—35	—18	34.8
Dec. 20, 1887	North Platte, Nebr	30	—48		27.6
Dec. 21, 1887	St. Louis, Mo	42	—42	—29	21.2
Dec. 28, 1887	Kansas City, Mo	32	—42	—38	21.3
Dec. 29, 1887	Wilmington, N. C	60	—32	—48	26.7
Dec. 25, 1888	Des Moines, Iowa	52	—32	—27	9.5
Dec. 11, 1889	Springfield, Mo	62	—26	—27	18.1
Dec. 25, 1889	Des Moines, Iowa	60	—34	—35	8.4
Dec. 30, 1889	Chicago, Ill	60	—44	—36	31.8
Jan. 12, 1880	Madison, Wis	51	—41	—28	31.4
Jan. 21, 1880	Nashville, Tenn	58	—21	—22	3.1
Jan. 15, 1881	Burlington, Vt	37	—45	—23	26.7
Jan. 14, 1882	Milwaukee, Wis	35	—35	—30	12.1
Jan. 17, 1882	Denison, Tex	60	—44	—44	59.9
Jan. 14, 1883	Shreveport, La	60	—34	—36	31.4
Jan. 18, 1883	Davenport, Iowa	28	—23	—21	28.8
Jan. 19, 1883	Dodge City, Kans	22	—38	—27	12.5
Jan. 20, 1883	Corpus Christi, Tex	67	—45	—50	17.2
Jan. 6, 1884	Charleston, S. C	40	—32	—40	10.4
Jan. 19, 1884	Omaha, Nebr	37	—41	—28	31.1
Jan. 1, 1885	Parry Sound, Ont	47	—45	—32	43.6
Jan. 17, 1885	Montgomery, Ala	68	—45	—45	18.8
Jan. 18, 1885	Norfolk, Va	70	—45	—51	26.3
Jan. 25, 1885	Kansas City, Mo	31	—31	—21	14.4
Jan. 9, 1886	Montgomery, Ala	47	—39	—40	16.4
Jan. 17, 1887	Lamar, Mo	53	—42	—33	23.4
Jan. 18, 1887	Chattanooga, Tenn	58	—40	—44	34.2
Jan. 21, 1887	La Crosse, Wis	37	—40	—21	16.4
Jan. 24, 1887	Knoxville, Tenn	63	—29	—28	18.1

TABLE A.—COMPARISON OF OBSERVED AND COMPUTED GREATEST TEMPERATURE-FALLS IN COLD WAVES—Continued.

Date.	Place.	Temperature.	Observed temperature-fall.	Computed temperature-fall.	Observed extent of cold wave.
		°	°	°	°
Jan. 30, 1887	Yankton, S. Dak	30	—42	—35	18.9
Jan. 1, 1888	Palestine, Tex	64	—40	—41	26.0
Jan. 8, 1888	do	68	—48	—42	27.7
Jan. 15, 1888	do	48	—44	—36	23.8
Jan. 20, 1888	Cheyenne, Wyo	34	—42	—29	12.2
Jan. 9, 1889	Palestine, Tex	56	—26	—27	19.9
Jan. 17, 1889	St. Paul, Minn	38	—32	—17	27.9
Feb. 14, 1880	Chattanooga, Tenn	66	—30	—35	10.4
Feb. 28, 1880	Fort Elliott, Tex	48	—41	—28	13.5
Feb. 29, 1880	St. Louis, Mo	62	—42	—35	19.6
Feb. 13, 1881	Lynchburgh, Va	59	—31	—37	17.6
Feb. 21, 1882	Memphis, Tenn	66	—30	—34	14.0
Feb. 4, 1883	Shreveport, La	68	—42	—58	16.8
Feb. 17, 1883	Keokuk, Iowa	60	—60	—44	40.1
Feb. 25, 1883	Lamar, Mo	50	—24	—20	15.2
Feb. 6, 1884	Pittsburgh, Pa	60	—21	—31	16.5
Feb. 20, 1884	Davenport, Iowa	45	—42	—40	33.6
Feb. 8, 1885	Kansas City, Mo	36	—22	—15	16.0
Feb. 10, 1885	Nashville, Tenn	62	—44	—45	38.2
Feb. 11, 1885	Cape Henry, Va	64	—50	—47	31.6
Feb. 16, 1885	St. Louis, Mo	40	—39	—30	13.9
Feb. 10, 1886	Springfield, Mo	51	—20	—14	11.4
Feb. 16, 1886	Knoxville, Tenn	58	—33	—35	16.0
Feb. 26, 1886	Parry Sound, Ont	33	—40	—40	28.9
Feb. 1, 1887	Fort Elliott, Tex	45	—40	—41	7.5
Feb. 4, 1887	Palestine, Tex	67	—42	—58	23.4
Feb. 9, 1887	Alpena, Mich	46	—38	—30	16.7
Feb. 11, 1887	Lamar, Mo	63	—54	—51	26.8
Feb. 12, 1887	Columbus, Ohio	63	—44	—47	38.2
Feb. 19, 1887	Louisville, Ky	58	—25	—22	8.6
Feb. 25, 1887	Rockliffe, Ont	21	—43		20.1
Feb. 15, 1888	Kingston, Ont	34	—42	—33	36.8
Feb. 16, 1888	Boston, Mass	38	—40	—26	16.2
Feb. 20, 1888	Dubuque, Iowa	42	—27		21.6
Feb. 26, 1888	Toledo, Ohio	48	—34	—27	19.1
Feb. 6, 1889	Port Huron, Mich	36	—46	—40	20.1
Feb. 17, 1889	Palestine, Tex	56	—28	—36	21.4
Feb. 23, 1889	Erie, Pa	32	—40	—34	31.5
Mar. 17, 1880	Atlanta, Ga	61	—26	—40	3.5
Mar. 4, 1881	Chattanooga, Tenn	58	—30	—25	7.8
Mar. 10, 1882	Memphis, Tenn	64	—21	—26	3.7
Mar. 21, 1882	Fort Smith, Ark	66	—30	—32	21.1
Mar. 19, 1883	Kansas City, Mo	53	—38	—38	34.8
Mar. 12, 1884	Fort Smith, Ark	66	—32	—40	20.3
Mar. 17, 1885	Cincinnati, Ohio	30	—21	—27	18.6
Mar. 10, 1886	Shreveport, La	50	—20	—34	12.3
Mar. 13, 1886	Davenport, Iowa	30	—15	—11	5.2
Mar. 21, 1886	Indianapolis, Ind	59	—27	—24	12.8
Mar. 3, 1887	St. Louis, Mo	60	—27	—31	15.6
Mar. 14, 1887	Cincinnati, Ohio	54	—30	—30	15.3
Mar. 3, 1888	St. Louis, Mo	60	—36	—46	22.4
Mar. 20, 1888	Keokuk, Iowa	56	—40	—22	19.9
Mar. 16, 1889	Springfield, Mo	54	—22	—28	2.7
Oct. 17, 1880	Columbus, Ohio	65	—26	—19	
Oct. 27, 1880	Toledo, Ohio	54	—16	—13	
Oct. 5, 1881	Pittsburgh, Pa	68	—24	—16	
Oct. 13, 1881	Kansas City, Mo	69	—28	—20	

TABLE X.—COMPARISON OF OBSERVED AND COMPUTED GREATEST TEMPERATURE-FALLS IN COLD WAVES—Continued.

Date.	Place.	Temperature.	Observed temperature-fall.	Computed temperature-fall.	Observed extent of cold wave.
		°	°	°	°
Oct. 30, 1881	Des Moines, Iowa	55	—15	— 9	
Oct. 14, 1882	Louisville, Ky	67	—16	—10	
Oct. 14, 1883	St. Louis, Mo	58	—15	—11	
Oct. 4, 1885	Indianapolis, Ind	59	—18	—12	
Oct. 14, 1886	Kansas City, Mo	69	—16	—16	
Oct. 16, 1886	Albany, N. Y	63	—26	—18	
Oct. 21, 1886	Marquette, Mich	66	—30	—23	
Oct. 5, 1887	Nashville, Tenn	56	—12	—12	
Oct. 12, 1887	Atlanta, Ga	62	—20	—15	
Oct. 3, 1888	Chattanooga, Tenn	62	—14	—16	
Oct. 20, 1888	Fort Smith, Ark	68	—30	—27	
Oct. 2, 1889	Cincinnati, Ohio	60	—12	—10	
Nov. 11, 1880	Cairo, Ill	58	—16	—13	
Nov. 19, 1880	New York City	46	—23	—13	
Nov. 13, 1881	Cincinnati, Ohio	60	—17	—17	
Nov. 18, 1881	Kansas City, Mo	61	—36	—34	
Nov. 24, 1882	Chicago, Ill	39	—18	— 9	
Nov. 16, 1883	do	15	— 5	— 8	
Nov. 2, 1885	Cincinnati, Ohio	49	—13	— 8	
Nov. 14, 1885	Washington City	54	—21	—16	
Nov. 4, 1886	Sandusky, Ohio	53	—15	—10	
Nov. 10, 1887	St. Louis, Mo	52	—12	—15	
Nov. 3, 1888	Indianapolis, Ind	68	—26	—18	
Nov. 17, 1888	Washington City	50	—14	—15	
Nov. 14, 1889	Indianapolis, Ind	50	—12	—13	
Dec. 6, 1880	Louisville, Ky	60	—38	—43	
Dec. 17, 1880	Albany, N. Y	36	—17	—13	
Dec. 5, 1881	Montgomery, Ala	59	—14	—13	
Dec. 14, 1881	St. Louis, Mo	60	—30	—27	
Dec. 3, 1882	Cleveland, Ohio	40	—17	—15	
Dec. 8, 1882	Wilmington, N. C	50	—33	—25	
Dec. 15, 1882	Keokuk, Iowa	25	—20	—15	
Dec. 8, 1883	La Crosse, Wis	50	—26	—21	
Dec. 9, 1883	Columbus, Ohio	45	—15	—10	
Dec. 31, 1883	Palestine, Tex	66	—33	—32	
Dec. 6, 1884	Shreveport, La	57	—12	—12	
Dec. 19, 1884	Wilmington, N. C	53	—35	—37	
Dec. 11, 1885	do	62	—26	—24	
Dec. 26, 1885	Pittsburgh, Pa	32	—11	—14	
Dec. 6, 1886	Jacksonville, Fla	53	—24	—22	
Dec. 15, 1886	Omaha, Nebr	42	—28	— 6	
Dec. 16, 1886	Pensacola, Fla	58	—30	—25	
Dec. 12, 1887	La Crosse, Wis	24	—22	—21	
Dec. 13, 1887	Lynchburgh, Va	46	—16	—13	
Dec. 7, 1888	do	42	—18	—10	
Jan. 6, 1880	Washington City	50	—12	—15	
Jan. 10, 1880	La Crosse, Wis	49	—31	—26	
Jan. 18, 1880	Indianapolis, Ind	55	—19	—23	
Jan. 3, 1881	Des Moines, Iowa	23	—24	—12	
Jan. 14, 1881	Fort Sill, Ind. T	57	—50	—50	
Jan. 22, 1881	Fort Smith, Ark	28	— 8	— 5	
Jan. 9, 1882	Louisville, Ky	57	—23	—16	
Jan. 10, 1882	Washington City	45	—15	—12	
Jan. 12, 1883	Augusta, Ga	36	—13	—17	
Jan. 19, 1883	Dodge City, Kans	22	—38	—30	
Jan. 12, 1884	Mobile, Ala	58	—28	—32	

TABLE X.—COMPARISON OF OBSERVED AND COMPUTED GREATEST TEMPERATURE-FALLS IN COLD WAVES—Continued.

Date.	Place.	Temperature.	Observed temperature-fall.	Computed temperature-fall.	Observed extent of cold wave.
		°	°	°	°
Jan. 15, 1884	Washington City	33	—15	—17	
Jan. 3, 1885	Charlotte, N. C	22	—11	— 3	
Jan. 26, 1885	Columbus, Ohio	30	—22	—27	
Jan. 22, 1886	Erie, Pa	37	—21	—23	
Jan. 2, 1887	Wilmington, N. C	59	—34	—31	
Jan. 11, 1887	Washington City	25	—13	—11	
Jan. 2, 1888	Knoxville, Tenn	54	—30	—24	
Jan. 6, 1888	Philadelphia, Pa	38	—12	—21	
Jan. 14, 1888	Toledo, Ohio	40	—36	—35	
Jan. 5, 1889	St. Louis, Mo	40	—10	—14	
Feb. 8, 1880	Pittsburgh, Pa	35	—23	—24	
Feb. 9, 1880	St. Paul, Minn	30	—40	—27	
Feb. 26, 1880	Chicago, Ill	54	—15	—22	
Feb. 17, 1881	Pittsburgh, Pa	36	—16	—15	
Feb. 20, 1881	Norfolk, Va	65	—32	—30	
Feb. 9, 1882	Shreveport, La	60	—20	—20	
Feb. 10, 1882	Nashville, Tenn	56	—18	—19	
Feb. 18, 1883	Washington City	60	—30	—31	
Feb. 14, 1884	Cincinnati, Ohio	55	—35	—32	
Feb. 15, 1885	Kansas City, Mo	19	—11	—13	
Feb. 17, 1885	Toronto, Ont	29	—40	—31	
Feb. 5, 1886	Charlotte, N. C	21	—14	—19	
Feb. 22, 1887	Fort Smith, Ark	43	—11	—19	
Feb. 6, 1888	Chicago, Ill	24	—18	—20	
Feb. 9, 1889	Memphis, Tenn	46	—12	—13	
Feb. 18, 1889	Palestine, Tex	56	—28	—28	
Mar. 8, 1880	Alpena, Mich	34	—30	—18	
Mar. 28, 1880	St. Louis, Mo	61	—19	—17	
Mar. 9, 1881	Keokuk, Iowa	34	—11	—10	
Mar. 27, 1881	Augusta, Ga	62	—22	—23	
Mar. 11, 1882	New York City	60	—15	—14	
Mar. 3, 1883	Pittsburgh, Pa	54	—26	—24	
Mar. 24, 1883	Nashville, Tenn	43	—13	—19	
Mar. 10, 1884	Wilmington, N. C	61	—23	—27	
Mar. 7, 1885	St. Louis, Mo	42	—11	—11	
Mar. 17, 1886	Lynchburgh, Va	55	—17	—16	
Mar. 12, 1888	Charleston, S. C	60	—24	—26	
Mar. 13, 1888	New York City	24	—18	—18	
Mar. 1, 1889	Palestine, Tex	62	—16	—13	
Mar. 15, 1889	Concordia, Kans	52	—28	—27	

This method of computing the greatest fall is on the whole quite satisfactory, and is well adapted for use on account of its simplicity. A more accurate method could be devised involving consideration of pressure gradient and prospective extent of cold wave, but its complexity would detract from its practical value. This method is only to be used for computing a temperature-fall when there is a gradient of pressure of at least 0.5 of an inch in 500 miles, extending over a distance of at least 500 miles.

When the temperature gradients are comparatively slight, there being only three or four isotherms from the center of low pressure for a distance of 500 miles towards the northwest, the computed temperature-fall by the adopted rule is apt to be less than the actual fall in some instances. This corresponds to the cases referred to, in computing the extent of cold wave, where the extent of fall in temperature depends not only on the closeness of the isotherms, but also independently of the isotherms on the extent of low pressure. In this case, instead of computing the fall by the method described, it has been taken as five-sixths of the difference in temperature from the center of the low area for a distance of 500 miles towards the northwest, where the whole difference in temperature in that distance is not more than 30°.

This method does not provide for the cases where the greatest fall of temperature is not near the center of the low. But even if the vicinity of actual greatest fall is not hit upon, the temperature-fall computed will approximate closely to the actual fall at the point chosen.

The differences between the computed and observed greatest fall in temperature are not entirely satisfactory, but is the best that can be done without resort to great complexity of computation. The differences of the falls, computed minus observed, are shown in Table XI, arranged according to the magnitude of the fall. Column 1 contains the differences for all the falls between 10° and 20°; column 2 for those between 20° and 30°, etc. The probable error of a computed fall of temperature from the whole series of differences, 291 in number, is ±4.5. The probable error for the group of 57 between 10° and 20° is ±2.7; for the 58 between 20° and 30° ±4.5; for the 48 between 30° and 40°, ±4.6; for the remaining 39, all greater than 40, the probable error is ±6.5.

TABLE XI.—DIFFERENCES OF COMPUTED AND OBSERVED GREATEST FALLS OF TEMPERATURE IN COLD WAVES.

[Computed minus observed.]

Fall of 10° to 20°.	Fall of 20° to 30°.	Fall of 30° to 40°.	Fall of 40° to 50°.	Fall of 50° to 60°.
+8	+3	−6	+1	+3
+2	+13	+5	+11	+16
+3	+4	−9	+18	+3
+2	0	+3	+12	+3
+4	+6	−12	+13	0
+3	0	−7	−7	
+6	+6	−6	+13	
+6	+5	+2	+8	
+4	+11	+9	0	
−6	+3	+17	−5	
0	+6	−16	+11	
0	+5	+5	0	
+5	+11	−1	−6	
−2	−2	−2	+9	
+2	−10	−8	−4	
+3	−3	+10	−1	
0	+8	−1	+6	
+9	−6	+15	+8	
−3	−1	−5	+13	
+5	+13	−6	+13	
+5	−1	−4	+7	
+5	+2	+9	−16	
−3	+1	−2	+2	
−1	+7	+8	−1	
−1	−1	+7	−1	
+4	+4	−6	−16	
+1	−10	+5	+1	
+2	+7	−2	+9	
+5	+6	0	+14	
+5	+3	−8	+6	
0	−14	0	+6	
−3	−5	−10	−18	
−4	−6	+4	+13	
+3	−14	+7	+9	
+3	+3	+3		
−4	−4	+2		
−2	+7	−5		
+8	+8	+3		
+2	+8	+8		

TABLE XI.—DIFFERENCES OF COMPUTED AND OBSERVED GREATEST FALLS OF TEMPERATURE IN COLD WAVES—Continued.

Fall of 10° to 20°.	Fall of 20° to 30°.	Fall of 30° to 40°.	Fall of 40° to 50°.	Fall of 50° to 60°.
−9	+8	+1		
−4	+10	−2		
−7	+8	+5		
+1	+5	+8		
−1	+2	+3		
−2	+12	+1		
−5	+7	+2		
−8	−4	−1		
−2	+5	+3		
−1	−2			
+2	+6			
+1	−1			
+1	0			
−6	0			
0	−1			
+1	+2			
0	−4			
+3	−2			
	+1			

The following is the distribution of the errors in 201 cases: In 14 cases the error is 0; in 26 cases it is ±1°; in 24 cases, ±2°; in 22 cases, ±3°; in 14 cases, ±4°; in 19 cases, ±5°; in 19 cases, ±6°; in 10 cases, ±7°; in 15 cases, ±8°; in 8 cases, ±9°; in 5 cases, ±10°; in 4 cases, ±11°; in 3 cases, ±12°; in 7 cases, ±13°; in 3 cases, ±14°; in 1 case, 15°; in 4 cases, ±16°; in 1 case, 17°, and in 2 cases, 18°.

The plus signs predominate in the differences. The computed fall for 10° to 20° is, on the average, one degree less than the observed; between 20° and 30°, two degrees less; between 30° and 40°, half a degree less; between 40° and 50°, four degrees less, and greater than 50°, five degrees less. On the average for all cases the computed maximum fall of temperature is two degrees lower than the observed.

The extent of fall of temperature on the average varies with the magnitude of greatest temperature fall, but the extent of fall can not be used to advantage to determine the greatest fall, as will be seen from the comparison given below.

TEMPERATURE AT PLACE OF GREATEST TEMPERATURE FALL. GREATEST FALL AND EXTENT OF COLD WAVE.

20° to 30°.			30° to 40°.			40° to 50°.			50°+.		
Temperature.	Fall of temperature.	Extent of cold wave.	Temperature.	Fall of temperature.	Extent of cold wave.	Temperature.	Fall of temperature.	Extent of cold wave.	Temperature.	Fall of temperature.	Extent of cold wave.
°			°			°			°		
62	—27	10	63	—30	14	70	—42	20	68	—58	31
71	—29	11	67	—31	14	70	—46	24	60	—60	40
63	—23	5	66	—38	17	52	—40	27	64	—50	32
65	—23	12	68	—32	21	56	—44	32	63	—54	27
63	—23	7	64	—33	16	61	—41	22			
58	—27	7	63	—30	25	32	—42	37			
	—25	9	63	—34	28	37	—45	19			
	—20	21	74	—39	17	64	—41	21			
	—25	5	68	—33	13	30	—48	28			
66	—20	5	46	—30	14	42	—42	21			
34	—22	8	50	—35	5	32	—42	21			
	—20	15	60	—32	27	60	—44	32			
60	—23	21	52	—32	10	51	—41	31			
		18	60	—34	8	37	—45	27			
39	—18	6	35	—35	12	60	—44	60			
65	—29	20	60	—34	31	67	—45	17			
55	—21	10	40	—32	10	37	—41	31			
63	—29	20	31	—31	14	48	—43	44			
69	—26	19	47	—39	16	68	—45	19			
49	—23	8	38	—32	28	70	—45	26			
58	—21	11	66	—30	10	53	—42	23			
54	—21	7	59	—31	18	58	—40	34			
64	—29	6	66	—30	14	37	—40	16			
63	—23	12	40	—39	14	30	—42	19			
60	—28	7	58	—33	16	64	—40	26			
28	—28	0	46	—38	17	68	—48	28			
68	—24	8	48	—34	19	48	—44	24			
64	—24	20	56	—30	21	34	—42	12			
36	—25	10	58	—30	8	48	—41	14			
54	—22	6	66	—30	21	62	—42	20			
64	—26	6	53	—38	35	68	—42	17			
62	—26	18	66	—32	20	45	—42	34			
58	—21	3	54	—30	15	62	—44	38			
28	—23	29	60	—36	22	33	—40	29			
63	—29	18	54	—32	3	45	—40	8			
56	—26	20				67	—42	23			
50	—24	15				63	—44	38			
60	—21	17				34	—42	37			
36	—22	16				38	—40	16			
51	—20	11				36	—46	20			
58	—25	9				32	—40	32			
42	—27	22				56	—40	20			
61	—26	4									
64	—21	4									
30	—21	19									
50	—20	12									
59	—27	13									
60	—27	16									
Mean..		12	Mean..		17	Mean..		26	Mean..		33

The extent of cold wave or quantity of fall in the cone of temperature fall being derived, as previously described, and the maximum temperature fall being computed, the next step will be to derive from these two data the area inclosed by the 20° fall curve. The extent of temperature fall as computed, however, instead of being a cone, is more accurately a cone of fall greater than 10° surmounting an elliptical cylinder of 10° fall.

Table XII gives the contents such a figure below the 10° fall curve, when the contents of the whole figure is known, and its altitude, which is the maximum temperature fall expressed in units of 10°. The top row of figures gives the greatest temperature fall. The first column gives the total extent of cold wave, the unit being a 10° fall over an area of 100,000 square miles.

TABLE XII.—EXTENT OF TEMPERATURE FALL BELOW 10° TEMPERATURE-FALL PLANE.

Total extent cold wave.	Greatest temperature fall.								
	20°.	25°.	30°.	35°.	40°.	45°.	50°.	55°.	60°.
2	1.5	1.4	1.2	1.1	1.0	1.0	0.9	0.9	0.8
4	3.0	2.7	2.4	2.2	2.0	1.8	1.7	1.6	1.5
6	4.5	4.0	3.6	3.3	3.0	2.8	2.6	2.4	2.2
8	6.0	5.4	4.8	4.4	4.0	3.7	3.4	3.2	3.0
10	7.5	6.8	6.0	5.5	5.0	4.7	4.3	4.0	3.8
12	9.0	8.1	7.2	6.6	6.0	5.6	5.2	4.8	4.5
14	10.5	9.5	8.4	7.7	7.0	6.5	6.0	5.7	5.3
16	12.0	10.8	9.6	8.8	8.0	7.6	6.9	6.4	6.0
18	13.5	12.2	10.8	9.9	9.0	8.3	7.7	7.2	6.8
20	15.0	13.5	12.0	11.0	10.0	9.3	8.6	8.0	7.5
22	16.5	14.8	13.2	12.1	11.0	10.2	9.4	8.8	8.3
24	18.0	16.2	14.4	13.2	12.0	11.2	10.3	9.6	9.0
26	19.5	17.6	15.6	14.3	13.0	12.0	11.1	10.4	9.8
28	21.0	18.9	16.8	15.4	14.0	13.0	12.0	11.3	10.5
30	22.5	20.2	18.0	16.5	15.0	14.0	12.9	12.1	11.3
32	24.0	21.6	19.2	17.6	16.0	14.8	13.7	12.8	12.0
34	25.5	23.0	20.4	18.7	17.0	15.8	14.7	13.8	12.8
36	27.0	24.3	21.6	19.8	18.0	16.7	15.4	14.4	13.5
38	28.5	25.6	22.8	20.9	19.0	17.7	16.3	15.3	14.3
40	30.0	27.0	24.0	22.0	20.0	18.6	17.2	16.1	15.0
42	31.5	28.4	25.2	23.1	21.0	19.5	18.0	16.9	15.8
44	33.0	29.7	26.4	24.2	22.0	20.4	18.9	17.7	16.5
46	34.5	31.0	27.6	25.3	23.0	21.4	19.7	18.5	17.3
48	36.0	32.4	28.8	26.4	24.0	22.3	20.6	19.3	18.0
50	37.5	33.8	30.0	27.5	25.0	23.2	21.4	20.1	18.8
52	39.0	35.1	31.2	28.6	26.0	24.2	22.3	20.9	19.5
54	40.5	36.4	32.4	29.7	27.0	25.1	23.2	21.8	20.3
56	42.0	37.8	33.6	30.8	28.0	26.0	24.0	22.5	21.0
58	43.5	39.2	34.8	31.9	29.0	26.9	24.9	23.4	21.8
60	45.0	40.5	36.0	33.0	30.0	27.8	25.7	24.1	22.5

The number derived for the extent of cold wave below the plane of 10° fall when multiplied by 100,000 gives the area in square miles inclosed by the 10° temperature-fall curve.

Table XIII gives the area in square miles inclosed by the 20° fall curve for various maximum temperature falls and various extents of fall above the plane of 10° fall. This latter is the difference between the total extent of fall and the extent of fall below the 10° fall-plane as derived from Table XII.

TABLE XIII.—AREAS OF TWENTY-DEGREE TEMPERATURE-FALL IN SQUARE MILES.

Extent of temperature-fall above 10° plane.	Maximum temperature-fall.					
	22°.	24°.	26°.	28°.	30°.	32°.
1	10,000	20,000	30,000	30,000	40,000	40,000
2	10,000	30,000	50,000	60,000	80,000	80,000
3	20,000	50,000	80,000	90,000	120,000	120,000
4	20,000	70,000	110,000	120,000	160,000	160,000
5	30,000	90,000	130,000	160,000	190,000	200,000
6	30,000	110,000	160,000	190,000	230,000	240,000
7	40,000	130,000	190,000	220,000	270,000	280,000
8	50,000	150,000	220,000	250,000	310,000	330,000
9	60,000	170,000	240,000	290,000	340,000	380,000
10	70,000	180,000	270,000	330,000	380,000	420,000
11	70,000	190,000	300,000	360,000	420,000	460,000
12	80,000	210,000	330,000	390,000	450,000	500,000
13	90,000	220,000	360,000	420,000	480,000	540,000
14	90,000	240,000	380,000	450,000	510,000	580,000
15	100,000	260,000	400,000	490,000	560,000	610,000
16	100,000	280,000	430,000	520,000	600,000	650,000
17	110,000	300,000	460,000	550,000	640,000	690,000
18	120,000	320,000	480,000	580,000	680,000	730,000
19	130,000	340,000	500,000	620,000	720,000	770,000
20	140,000	350,000	530,000	660,000	750,000	810,000
21	140,000	370,000	560,000	690,000	790,000	850,000
22	150,000	390,000	590,000	720,000	840,000	890,000
23	150,000	410,000	620,000	750,000	890,000	930,000
24	160,000	420,000	640,000	780,000	900,000	970,000
25	170,000	440,000	660,000	820,000	940,000	1,020,000
26	180,000	460,000	690,000	860,000	970,000	1,060,000
27	180,000	480,000	710,000	890,000	1,020,000	1,100,000
28	190,000	500,000	740,000	920,000	1,060,000	1,140,000
29	190,000	510,000	760,000	960,000	1,090,000	1,180,000
30	200,000	530,000	790,000	990,000	1,120,000	1,220,000
31	200,000	540,000	820,000	1,020,000	1,160,000	1,260,000
32	210,000	560,000	850,000	1,050,000	1,200,000	1,300,000
33	210,000	580,000	880,000	1,080,000	1,240,000	1,340,000
34	220,000	600,000	900,000	1,120,000	1,270,000	1,380,000
35	230,000	610,000	930,000	1,150,000	1,310,000	1,420,000

TABLE XIII.—AREAS OF TWENTY-DEGREE TEMPERATURE-FALL IN SQUARE MILES—Continued.

Extent of temperature-fall above 10° plane.	Maximum temperature-fall.					
	32°.	34°.	36°.	40°.	44°.	48°.
1	40,000	40,000	50,000	40,000	40,000	40,000
2	80,000	80,000	90,000	80,000	80,000	80,000
3	120,000	120,000	130,000	120,000	120,000	120,000
4	160,000	160,000	170,000	170,000	170,000	160,000
5	200,000	210,000	220,000	220,000	220,000	210,000
6	240,000	250,000	270,000	270,000	260,000	250,000
7	280,000	290,000	310,000	310,000	310,000	300,000
8	330,000	330,000	350,000	350,000	360,000	340,000
9	380,000	380,000	400,000	390,000	400,000	380,000
10	420,000	430,000	440,000	440,000	440,000	430,000
11	460,000	470,000	480,000	480,000	490,000	470,000
12	500,000	510,000	530,000	530,000	530,000	510,000
13	540,000	550,000	570,000	580,000	580,000	550,000
14	580,000	600,000	610,000	630,000	620,000	600,000
15	610,000	640,000	660,000	670,000	660,000	640,000
16	650,000	680,000	700,000	710,000	710,000	680,000
17	690,000	720,000	740,000	750,000	750,000	730,000
18	730,000	760,000	780,000	790,000	800,000	780,000
19	770,000	800,000	820,000	840,000	840,000	820,000
20	810,000	850,000	870,000	890,000	880,000	860,000
21	850,000	890,000	920,000	930,000	920,000	900,000
22	890,000	930,000	960,000	980,000	970,000	940,000
23	930,000	970,000	1,000,000	1,030,000	1,010,000	990,000
24	970,000	1,010,000	1,040,000	1,070,000	1,060,000	1,030,000
25	1,020,000	1,060,000	1,090,000	1,110,000	1,100,000	1,070,000
26	1,060,000	1,110,000	1,130,000	1,150,000	1,140,000	1,110,000
27	1,100,000	1,160,000	1,170,000	1,190,000	1,190,000	1,160,000
28	1,140,000	1,210,000	1,210,000	1,230,000	1,240,000	1,200,000
29	1,180,000	1,250,000	1,260,000	1,280,000	1,280,000	1,250,000
30	1,220,000	1,280,000	1,310,000	1,330,000	1,320,000	1,290,000
31	1,260,000	1,330,000	1,360,000	1,370,000	1,370,000	1,340,000
32	1,300,000	1,370,000	1,400,000	1,420,000	1,410,000	1,380,000
33	1,340,000	1,420,000	1,450,000	1,460,000	1,460,000	1,420,000
34	1,380,000	1,460,000	1,490,000	1,500,000	1,500,000	1,460,000
35	1,420,000	1,490,000	1,530,000	1,550,000	1,540,000	1,500,000

TABLE XIII.—AREAS OF TWENTY-DEGREE TEMPERATURE-FALL IN SQUARE MILES—Continued.

Extent of temperature-fall above 10° plane.	Maximum temperature-fall.				
	48°.	52°.	56°.	60°.	64°.
1	40,000	40,000	40,000	40,000	40,000
2	80,000	80,000	80,000	80,000	80,000
3	120,000	120,000	120,000	120,000	120,000
4	160,000	160,000	160,000	160,000	160,000
5	210,000	210,000	200,000	190,000	190,000
6	250,000	250,000	240,000	230,000	230,000
7	300,000	290,000	280,000	270,000	260,000
8	340,000	330,000	320,000	310,000	300,000
9	380,000	370,000	360,000	340,000	340,000
10	430,000	410,000	400,000	380,000	370,000
11	470,000	450,000	440,000	420,000	410,000
12	510,000	490,000	480,000	460,000	450,000
13	550,000	530,000	520,000	500,000	480,000
14	600,000	580,000	560,000	540,000	520,000
15	640,000	620,000	600,000	580,000	550,000
16	680,000	660,000	640,000	620,000	590,000
17	730,000	700,000	680,000	650,000	630,000
18	780,000	740,000	720,000	680,000	670,000
19	820,000	780,000	760,000	720,000	710,000
20	860,000	830,000	800,000	760,000	740,000
21	900,000	870,000	840,000	800,000	780,000
22	940,000	910,000	880,000	840,000	820,000
23	990,000	950,000	920,000	870,000	860,000
24	1,030,000	1,000,000	960,000	910,000	890,000
25	1,070,000	1,040,000	1,010,000	950,000	920,000
26	1,110,000	1,080,000	1,050,000	990,000	960,000
27	1,160,000	1,120,000	1,090,000	1,020,000	1,000,000
28	1,200,000	1,160,000	1,130,000	1,060,000	1,040,000
29	1,250,000	1,200,000	1,170,000	1,100,000	1,080,000
30	1,290,000	1,250,000	1,200,000	1,140,000	1,110,000
31	1,340,000	1,290,000	1,240,000	1,180,000	1,150,000
32	1,380,000	1,330,000	1,280,000	1,220,000	1,190,000
33	1,420,000	1,370,000	1,320,000	1,260,000	1,230,000
34	1,460,000	1,410,000	1,360,000	1,300,000	1,260,000
35	1,500,000	1,460,000	1,400,000	1,340,000	1,290,000

From the computed extent of temperature-fall and the computed greatest fall of temperature by means of Tables XII and XIII, the areas of fall included by the 20° and 10° temperature-fall lines are obtained given in Table XIV. There is shown alongside of them the observed 10° and 20° temperature-fall areas, and also the observed and computed maximum falls of temperature:

TABLE XIV.—OBSERVED AND COMPUTED TEMPERATURE-FALL.

[Areas in square miles.]

Date.	Computed greatest fall of temperature.	Observed greatest fall of temperature.	Computed 20° fall area.	Observed 20° fall area.	Computed 10° fall area.	Observed 10° fall area.
	°	°				
Oct. 16, 1882	—26	—27	36,000	126,000	270,000	581,000
Oct. 8, 1884	—28	—30	45,000	170,000	250,000	838,000
Oct. 22, 1884	—21	—23	10,000	48,000	220,000	285,000
Oct. 4, 1885	—20	—23	....	26,000	750,000	848,000
Oct. 20, 1885	—25	—23	90,000	....	610,000	491,000
Oct. 20, 1886	—25	—27	46,000	96,000	470,000	400,000
Oct. 24, 1887	—23	—28	68,000	287,000	680,000	1,228,000
Oct. 2, 1888	—17	....	....	....	975,000	911,000
Oct. 19, 1888	—25	....	33,000	111,000	340,000	556,000
Oct. 9, 1887	—25	—20	70,000	27,000	680,000	294,000
Nov. 19, 1881	—41	—42	1,200,000	508,000	1,380,000	854,000
Nov. 12, 1882	—35	—46	190,000	388,000	550,000	1,134,000
Nov. 6, 1883	—25	—29	65,000	350,000	610,000	1,115,000
Nov. 12, 1883	—23	—29	75,000	297,000	740,000	1,187,000
Nov. 5, 1884	—16	—21	....	26,000	520,000	717,000
Nov. 23, 1884	—22	—40	70,000	531,000	680,000	1,370,000
Nov. 24, 1884	—32	—44	360,000	672,000	1,050,000	1,399,000
Nov. 30, 1884	— 8	....	....	....	500,000	372,000
Nov. 13, 1886	—22	—28	50,000	155,000	470,000	365,000
Nov. 23, 1886	—28	—41	1,020,000	456,000	2,520,000	1,091,000
Nov. 26, 1886	—31	—33	90,000	302,000	420,000	596,000
Nov. 20, 1887	—25	—30	160,000	203,000	1,220,000	784,000
Nov. 23, 1887	—17	—28	....	178,000	750,000	716,000
Nov. 27, 1887	—43	—42	530,000	891,000	1,150,000	1,427,000
Nov. 9, 1888	—26	—24	190,000	176,000	1,480,000	422,000
Nov. 12, 1889	—16	—18	....	....	1,050,000	829,000
Dec. 21, 1881	—14	—22	....	30,000	1,125,000	378,000
Dec. 27, 1883	—36	—45	280,000	451,000	770,000	930,000
Dec. 13, 1884	—32	—26	220,000	51,000	840,000	378,000
Dec. 31, 1884	—48	—41	370,000	391,000	720,000	1,062,000
Dec. 5, 1885	—18	—35	....	863,000	1,350,000	1,576,000
Dec. 21, 1887	—29	—42	430,000	338,000	1,920,000	1,136,000
Dec. 28, 1887	—38	—42	440,000	564,000	1,000,000	906,000
Dec. 29, 1887	—48	—32	700,000	830,000	1,250,000	1,179,000
Dec. 25, 1888	—27	—32	110,000	80,000	750,000	589,000
Dec. 25, 1889	—35	—34	185,000	258,000	550,000	361,000
Dec. 30, 1889	—36	—44	670,000	749,000	1,870,000	1,460,000
Jan. 14, 1882	—30	—35	170,000	134,000	660,000	683,000
Jan. 17, 1882	—44	—44	1,190,000	1,101,000	2,320,000	2,929,000
Jan. 14, 1883	—36	—34	270,000	554,000	770,000	1,654,000
Jan. 18, 1883	—21	—23	....	96,000	600,000	1,676,000
Jan. 19, 1883	—27	—30	140,000	213,000	840,000	558,000
Jan. 20, 1883	—50	—45	700,000	386,000	1,250,000	772,000
Jan. 6, 1884	—40	—32	670,000	210,000	1,500,000	528,000
Jan. 19, 1884	—28	—41	....	703,000	....	1,376,000
Jan. 1, 1885	—32	—43	660,000	1,060,000	2,080,000	1,970,000
Jan. 17, 1885	—45	—45	380,000	415,000	760,000	844,000
Jan. 18, 1885	—51	—45	960,000	439,000	1,720,000	1,344,000

TABLE XIV.—OBSERVED AND COMPUTED TEMPERATURE-FALL—Continued.

Date.	Computed greatest fall of temperature.	Observed greatest fall of temperature.	Computed 20° fall area.	Observed 20° fall area.	Computed 10° fall area.	Observed 10° fall area.
	°	°				
Jan. 25, 1885	—27	—31	100,000	319,000	640,000	739,000
Jan. 9, 1886	—40	—39	440,000	397,000	1,050,000	739,000
Jan. 17, 1887	—33	—42	260,000	621,000	870,000	1,099,000
Jan. 18, 1887	—44	—40	920,000	660,000	1,860,000	1,754,000
Jan. 8, 1888	—42	—48	670,000	476,000	1,400,000	1,390,000
Jan. 15, 1888	—36	—44	530,000	513,000	1,430,000	1,046,000
Jan. 20, 1888	—29	—42	110,000	235,000	540,000	640,000
Jan. 9, 1889	—27	—26	170,000	119,000	1,080,000	1,270,000
Feb. 29, 1880	—35	—42	....	506,000	....	921,000
Feb. 13, 1881	—37	—31	340,000	164,000	900,000	1,047,000
Feb. 21, 1882	—34	—30	230,000	272,000	660,000	739,000
Feb. 4, 1883	—58	—42	390,000	337,000	600,000	872,000
Feb. 17, 1883	—44	—60	530,000	1,064,000	1,070,000	1,381,000
Feb. 25, 1883	—20	—24	....	189,000	980,000	909,000
Feb. 6, 1884	—31	—21	170,000	198,000	660,000	989,000
Feb. 20, 1884	—42	—32	350,000	895,000	800,000	1,377,000
Feb. 10, 1885	—45	—44	750,000	960,000	1,480,000	1,788,000
Feb. 16, 1885	—30	—39	140,000	155,000	540,000	787,000
Feb. 19, 1886	—14	—20	....	60,000	750,000	683,000
Feb. 16, 1886	—35	—33	260,000	201,000	720,000	951,000
Feb. 26, 1886	—40	—40	670,000	606,000	1,550,000	1,343,000
Feb. 1, 1887	—41	—40	350,000	215,000	800,000	319,000
Feb. 4, 1887	—58	—42	320,000	289,000	490,000	1,262,000
Feb. 9, 1887	—30	—38	160,000	426,000	600,000	786,000
Feb. 11, 1887	—51	—54	420,000	506,000	760,000	1,204,000
Feb. 12, 1887	—43	—44	800,000	1,015,000	1,640,000	1,602,000
Feb. 19, 1887	—22	—25	40,000	140,000	1,710,000	499,000
Feb. 25, 1887	—40	—40	440,000	446,000	1,000,000	946,000
Feb. 15, 1888	—33	—42	700,000	912,000	1,930,000	1,666,000
Feb. 16, 1888	—26	—40	130,000	440,000	1,080,000	780,000
Feb. 6, 1889	—40	—46	580,000	356,000	1,350,000	1,058,000
Feb. 17, 1889	—36	—30	340,000	372,000	940,000	1,158,000
Feb. 23, 1889	—34	—40	550,000	634,000	1,600,000	1,411,000
Mar. 17, 1880	—40	—26	170,000	spot.	400,000	233,000
Mar. 10, 1882	—26	—21	50,000	41,000	400,000	222,000
Mar. 21, 1882	—32	—30	220,000	490,000	750,000	1,028,000
Mar. 17, 1885	—27	—21	120,000	216,000	840,000	1,122,000
Mar. 10, 1886	—34	—20	185,000	8,000	550,000	796,000
Mar. 3, 1887	—31	—27	190,000	218,000	720,000	916,000
Mar. 14, 1887	—30	—30	230,000	227,000	960,000	900,000
Mar. 3, 1888	—46	—36	320,000	478,000	650,000	1,134,000
Mar. 20, 1888	—22	—40	50,000	284,000	1,860,000	1,112,000
Mar. 16, 1889	—28	—32	110,000	42,000	640,000	156,000
Oct. 16, 1886	—20	—20	....	280,000	1,350,000	967,000
Oct. 12, 1887	—20	—20	....	....	1,200,000	972,000
Nov. 7, 1880	—37	—31	100,000	282,000	280,000	733,000
Nov. 20, 1881	—33	—38	400,000	271,000	1,250,000	970,000
Nov. 13, 1882	—41	—32	....	481,000	....	1,043,000
Nov. 14, 1882	—30	—33	....	334,000	....	818,000
Nov. 24, 1882	—10	—18	....	....	600,000	399,000
Nov. 7, 1883	—21	—21	....	155,000	600,000	604,000
Nov. 10, 1883	—10	—12	....	....	300,000	91,000
Nov. 13, 1883	—26	—26	560,000	320,000	1,430,000	1,102,000
Nov. 15, 1883	—17	—23	....	57,000	520,000	490,000
Nov. 27, 1883	—42	—30	350,000	567,000	780,000	930,000
Nov. 7, 1885	—18	—29	....	70,000	1,200,000	385,000

TABLE XIV.—OBSERVED AND COMPUTED TEMPERATURE-FALL—Continued.

Date.	Computed greatest fall of temperature.	Observed greatest fall of temperature.	Computed 20° fall area.	Observed 20° fall area.	Computed 10° fall area.	Observed 10° fall area.
	°	°				
Nov. 8, 1885	—20	—23	....	50,000	830,000	793,000
Nov. 13, 1885	—27	—34	110,000	460,000	740,000	1,498,000
Nov. 18, 1886	—45	—39	480,000	421,000	930,000	729,000
Nov. 28, 1887	—55	—58	360,000	806,000	610 000	1,202,000
Nov. 28, 1889	—34	—24	160,000	120,000	500,000	1,246,000
Dec. 9, 1880	—28	—25	120,000	103,000	630,000	597,000
Dec. 13, 1886	—13	—15	....	....	1,000,000	178,000
Dec. 20, 1887	—10	—48	....	723,000	....	1,245,000
Dec. 11, 1889	—27	—26	90,000	334,000	520,000	1,022,000
Jan. 15, 1881	—40	—45	310,000	848,000	700,000	1,097,000
Jan. 24, 1887	—28	—29	190,000	369,000	900,000	1,014,000
Mar. 4, 1881	—25	—30	80,000	132,000	750,000	422,000
Mar. 21, 1886	—24	—27	130,000	144,000	1,480,000	772,000
Nov. 26, 1883	—40	—40	370,000	830,000	850,000	1,266,000
Dec. 29, 1889	—30	—40	250,000	566,000	960,000	1,392,000
Jan. 21, 1887	—21	—40	....	239,000	....	896,000
Jan. 30, 1887	—35	—42	170,000	470,000	500,000	791,000
Jan. 1, 1888	—41	—40	500,000	393,000	1,150,000	1,423,000
Jan. 17, 1889	—17	—32	....	....	....	1,458,000
Feb. 8, 1885	—15	—22	....	244,000	680,000	923,000
Feb. 19, 1887	—22	—25	40,000	140,000	1,730,000	499,000
Feb. 20, 1888	—22	—40	....	283,000	....	1,220,000
Feb. 26, 1888	....	—20	....	25,000	....	1,059,000
Mar. 12, 1884	—40	—32	580,000	468,000	1,300,000	1,016,000

The agreement of the computed areas of temperature-fall with those that actually occurred, in many cases is not close, but they are nevertheless tolerably satisfactory. The real efficiency of the method can only be seen from a comparison of the computed temperature-falls for the various places with those actually observed. This would require so much space that no attempt will be made to make the display here. In the case of a very flat cone of temperature-fall a difference of a few degrees in the falls of temperature at a number of points will make a very great difference in the area inclosed by the 20° temperature-fall line. On October 4, 1885, for instance, the observed area of 20° temperature-fall is 26,000 square miles, and that of the 10° temperature-fall 848,000.

Alpena, with a fall of 21°, and Detroit, with a fall of 23°, are the only places inside the 20° curve. At numerous other places the falls are 16°, 18°, and 19°.

If the fall of temperature had been 5° greater at 16 stations, the area covered by the 20° fall curve would have been 600,000 square miles.

THE SHAPE AND THE POSITION OF THE TEMPERATURE-FALL AREAS.

The shape of the temperature-fall areas in more than 90 per cent. of the cases of cold waves is elliptical with the long axis lying from northeast to southwest. Where the areas lies differently, the reasons for it are not always apparent. The long axis of an area of fall is usually parallel to the long axis of the low area of pressure preceding. It is sure to extend in the direction in which the low area is open. This is also parallel to the general direction of the isothermal lines.

The type of map which has a low, not very deep, about 29.7 inches at center in Texas, with an extensive high area to the north of it, with cup-shaped isotherms in the region of high pressure, has the long axis of temperature-fall area directly north and south in most instances.

The 20° temperature-fall areas greater than 200,000 square miles may be divided into three classes.

In the first class, which is the most numerous, that in which the high area of pressure is to the northwest of the center of low pressure, the mean of 54 cases gives the long axis northeast to southwest 2.5 times that of the short axis perpendicular to it and running from northwest to southeast.

In the second class, where the high pressure is southwest of the low center, the mean of 13 cases gives the long axis 4.0 times that of the short one.

In the third case, that of exceptionally long areas of low pressure, and double V-shaped types of low pressure, the long axis as given by the mean of 18 cases is 5.0 times as great as the short axis.

On the whole no definite rule can be given for finding very accurately the shape of the 20° temperature-fall areas. Their shapes vary within wide limits. The greatest length of axis approximates the longest diameter of the last rounding isobar of the low area of pressure. The length of district through which the isotherms are close together and nearly parallel is some indication of the length of the axis. As a rule if the isotherms to the east, near the low center, are closer together than farther to the west, it is an indication that the long axis of the 20° temperature-fall area will be very much longer than the short axis. In the case of a high area of pressure to the southwest, it will be at least as long as the distance from the center of the low to the southeast front of the area of high pressure.

The shape of the 10° temperature-fall area pretty generally conforms to the shape of the 20° fall area, for areas with the ratio of the axis up to 4.0. For very great areas, it is not possible to measure the long axis of the 10° fall area accurately, the area usually extending beyond the limits of the region covered by observing stations.

Table XV gives for a number of the greatest cold waves, the observed length in miles of the long and short axis of the 20° temperature-fall areas and their ratios, also the ratios of the axis of the 10° fall areas.

TABLE XV.—RATIO OF AXES OF 20° AND 10° TEMPERATURE-FALL AREAS OF 200,000 SQUARE MILES OR MORE.

Date.	Length of axes 20° fall area.			Ratio of axes 10° area.	Date.	Length of axes 20° fall area.			Ratio of axes 10° area.
	North-east.	South-east.	Ratio.			North-east.	South-east.	Ratio.	
	Miles.	*Miles.*				*Miles.*	*Miles.*		
Oct. 8, 1884	950	300	3.2	2.0	Jan. 17, 1885	900	600	1.5	1.4
Nov. 7, 1880	600	600	1.0	2.0	Jan. 18, 1885	1,500	400	3.8	1.0
Nov. 19, 1881	1,300	300	4.3	2.6	Jan. 25, 1885	1,050	400	2.6	3.2
Nov. 20, 1881	1,100	250	4.4	3.0	Jan. 9, 1886	700	1,000	......	2.2
Nov. 12, 1882	1,150	300	3.8	2.0	Jan. 17, 1887	1,600	500	3.2	9.9
Nov. 13, 1882	1,700	200	8.5	4.0	Jan. 18, 1887	1,500	500	3.0	2.0
Nov. 14, 1882	1,200	300	4.0	3.4	Jan. 21, 1887	700	500	1.4	2.6
Nov. 6, 1883	1,200	350	3.4	2.6	Jan. 24, 1887	1,100	450	2.4	3.2
Nov. 7, 1883	950	150	6.3	3.6	Jan. 30, 1887	1,100	600	1.8	1.6
Nov. 12, 1883	806	600	1.3	1.6	Jan. 1, 1888	1,100	450	2.4	4.5
Nov. 13, 1883	1,100	200	5.5	5.6	Jan. 8, 1888	950	400	2.4	3.0
Nov. 26, 1883	1,300	1,000	1.3	1.8	Jan. 20, 1888	800	500	1.6	2.2
Nov. 27, 1883	1,700	400	4.2	3.3	Jan. 9, 1889	2,100	800	2.6	3.7
Nov. 23, 1884	1,600	900	1.8	2.0	Jan. 17, 1889	1,400	400	3.5	1.0
Nov. 24, 1884	1,600	500	3.2	2.2	Feb. 29, 1880	1,500	700	2.1	3.0
Nov. 13, 1885	1,300	350	3.7	3.2	Feb. 4, 1883	1,200	300	4.0	2.8
Nov. 13, 1886	700	250	2.8	2.0	Feb. 17, 1883	1,900	600	3.2	3.5
Nov. 18, 1886	1,050	400	2.6	1.7	Dec. 28, 1887	1,400	400	3.5	2.7
Nov. 23, 1886	1,050	500	2.1	2.0	Dec. 29, 1887	1,400	650	2.2	2.0
Nov. 26, 1886	800	450	1.8	1.6	Dec. 11, 1889	1,400	400	3.5	3.4
Nov. 20, 1887	700	450	1.6	1.6	Dec. 25, 1889	850	250	3.4	2.3
Nov. 23, 1887	1,050	300	3.5	2.8	Dec. 29, 1889	1,100	800	1.4	1.8
Nov. 27, 1887	1,500	800	1.8	2.0	Dec. 30, 1889	1,700	500	3.4	2.4
Nov. 28, 1887	1,900	500	3.8	3.6	Jan. 15, 1881	1.900	600	3.2	4.3
Nov. 9, 1888	800	300	2.7	1.7	Jan. 17, 1882	2,700	500	5.4	3.2
Dec. 27, 1883	1,400	450	3.1	2.3	Jan. 14, 1883	1,500	200	7.5	2.2
Dec. 31, 1884	1,250	350	3.6	2.6	Jan. 20, 1883	1,650	300	5.5	4.6
Dec. 5, 1885	1,700	850	2.0	2.0	Jan. 6, 1884	750	350	2.2	2.0
Dec. 20, 1887	1,450	700	2.1	2.0	Jan. 19, 1884	1,800	400	4.5	3.1
Dec. 21, 1887	850	400	2.0	1.1	Jan. 1, 1885	2,200	650	3.4	2.3

TABLE XV.—RATIO OF AXES OF 20° AND 10° TEMPERATURE-FALL AREAS OF 200,000 SQUARE MILES OR MORE—Continued.

Date.	Length of axes 20° fall area.			Ratio of axes 10° area.	Date.	Length of axes 20° fall area.			Ratio of axes 10° area.
	North-east.	South-east.	Ratio.			North-east.	South-east.	Ratio.	
	Miles.	*Miles.*				*Miles.*	*Miles.*		
Feb. 26, 1883	900	300	3.0	3.0	Feb. 16, 1888	1,200	300	4.0	2.8
Feb. 6, 1884	400	200	2.0	2.3	Feb. 26, 1888	800	400	2.0	2.0
Feb. 20, 1884	1,600	600	2.7	2.3	Feb. 6, 1889	800	400	2.0	1.7
Feb. 8, 1885	730	530	1.4	3.3	Feb. 17, 1889	1,600	300	5.3	2.3
Feb. 10, 1885	1,600	900	1.8	1.8	Feb. 23, 1889	1,900	350	5.4	3.6
Feb. 11, 1885	1,600	600	2.7	2.3	Mar. 21, 1882	900	500	1.8	2.0
Feb. 26, 1886	1,400	450	3.1	2.5	Mar. 19, 1883	2,200	500	4.4	4.5
Feb. 1, 1887	700	300	2.3	1.4	Mar. 12, 1884	1,500	400	3.8	3.2
Feb. 4, 1887	1,200	250	4.8	3.3	Mar. 3, 1887	1,700	500	3.4	2.8
Feb. 9, 1887	1,050	600	1.7	2.0	Mar. 14, 1887	1,000	200	5.0	5.3
Feb. 11, 1887	1,000	400	2.5	1.2	Mar. 3, 1888	1,400	600	2.3	3.0
Feb. 12, 1887	2,400	700	3.4	4.0	Mar. 20, 1888	900	350	2.6	3.3
Feb. 15, 1888	2,700	400	6.8	3.6					

The relation of the axes of 20° temperature-fall areas not being determinable with any very great accuracy, where nothing else is available for the purpose, it will be best to take the ratio of 2.5 to 1.0 for the case of the high pressure to the north of the center of low pressure, and for the case of the double V-shaped lows the ratio 5.0 to 1.0. When, however, a well-defined 20° fall area has already occurred, it is possible to form some idea of the length of one of the axes of the 20° fall area that is going to occur the next day.

The 20° temperature-fall areas on successive days very rarely overlap each other. When they do overlap, it is only slightly, not more than throughout a narrow strip of 50 miles in width. The greater the areas of the 20° temperature falls, the more apt successive areas are to be tangent to each other or nearly tangent.

The following list gives the cold waves and the areas of 20° fall tangent to each other or slightly overlapping:

SUCCESSIVE TWENTY-FOUR HOUR 20° FALLS TANGENT TO EACH OTHER.

Date.	Areas.	Date.	Areas.
	Sq. miles.		*Sq. miles.*
February 17, 1883	1,065,000	December 5, 1885	864,000
November 28, 1887	806,000	January 9, 1886	797,000
February 11, 1885	787,000	February 21, 1882	272,000
February 11, 1887	543,000	February 17, 1889	372,000
November 26, 1883	830,000	March 19, 1883	848,000
November 19, 1881	509,000	November 12, 1889	205,000
November 27, 1887	891,000	November 14, 1882	335,000
December 21, 1887	338,000	November 27, 1883	567,000
January 19, 1884	703,000	November 26, 1886	302,000
January 17, 1885	415,000	January 1, 1885	1,060,000
January 18, 1885	487,000	December 28, 1887	564,000
January 17, 1887	621,000	December 30, 1889	749,000
January 30, 1887	474,000	November 24, 1884	472,000
January 1, 1888	422,000	November 13, 1882	482,000
January 8, 1888	525,000	November 13, 1883	320,000
February 28, 1880	299,000	January 17, 1882	1,101,000
February 29, 1880	506,000	February 26, 1886	606,000
February 4, 1883	337,000	February 12, 1887	1,015,000
February 10, 1885	960,000	February 15, 1888	912,000
November 13, 1885	460,000	February 16, 1888	440,000
November 20, 1881	271,000	February 23, 1889	634,000

The center or position of maximum fall being known and the tangency taken as the farthest point east of the 20° fall curve of the preceding day, some idea can be formed of the length of the shorter axis of the 20° fall area. Implicit reliance can not, however, be placed on this proceeding. It must be considered in connection with other things.

The distance from center of low to highest isobar of high-pressure area, in the case of a high area to the southwest of a low pressure, is, approximately, in many cases the length of greater axis of 20° temperature-fall area. Where the 20° temperature-fall area is as small as 150,000 square miles, it is not apt to be tangent to the preceding 20° fall area.

The 10° temperature-fall areas on successive days do very generally overlap.

The eastern side of a 10° temperature-fall area is never any farther east than the first rounding line or outside isobar of the low area of pressure.

The rule given for computing the maximum fall of temperature, in or near a low center, can be applied in the case of other places on the map remote from the center. Though it may not give the actual fall at the point, it will at least give a value for the fall, which will not be exceeded, and which may be of some service in locating the position of the 20° fall area.

At the southern limit of a cold wave, where there is doubt about the position of the lower boundary of temperature-fall area, the wind direction will be of assistance at times in locating the position of the area. In the lower Mississippi Valley, as far as 300 or 400 miles from the Gulf of Mexico, when the winds, having been northwest or north, turn to the northeast, no farther fall or only slight falls of temperature need be anticipated.

From Table XVI, either axis of the 20° temperature-fall area being known, and the area, the other axis can be determined. From the known area, with an assumed ratio or the axes, the lengths of the axes can also be determined.

TABLE XVI.—AREAS OF ELLIPSES IN SQUARE MILES.

Major axis. Miles.	Minor axis. Miles. 100.	150.	200.	250.	300.	350.
100	8,000	....	....	....	....	....
200	16,000	24,000	31,000	....	....	....
300	24,000	35,000	47,000	59,000	71,000	....
400	31,000	47,000	63,000	79,000	94,000	110,000
500	39,000	59,000	79,000	98,000	118,000	137,000
600	47,000	71,000	94,000	118,000	141,000	165,000
700	55,000	82,000	110,000	137,000	165,000	192,000
800	63,000	94,000	126,000	157,000	188,000	220,000
900	71,000	106,000	141,000	177,000	212,000	247,000
1,000	....	118,000	157,000	196,000	236,000	275,000
1,100	....	....	173,000	216,000	259,000	302,000
1,200	....	....	188,000	236,000	283,000	330,000
1,300	....	....	204,000	255,000	306,000	357,000
1,400	....	....	220,000	275,000	330,000	385,000
1,500	....	....	236,000	294,000	353,000	412,000
1,600	....	....	....	314,000	377,000	440,000
1,700	....	....	....	334,000	400,000	467,000
1,800	....	....	....	353,000	424,000	495,000
1,900	....	....	....	....	447,000	522,000
2,000	....	....	....	....	....	550,000

TABLE XVI.—AREAS OF ELLIPSES IN SQUARE MILES—Continued.

Major axis. Miles.	Minor axis. Miles.						
	350.	400.	450.	500.	550.	600.	650.
400	110,000	126,000	....	....	....	....	....
500	137,000	157,000	177,000	196,000	....	....	....
600	165,000	188,000	212,000	236,000	259,000	283,000	....
700	192,000	220,000	247,000	275,000	302,000	330,000	341,000
800	220,000	251,000	283,000	314,000	345,000	377,000	408,000
900	247,000	283,000	318,000	353,000	389,000	424,000	459,000
1,000	275,000	314,000	353,000	392,000	432,000	471,000	510,000
1,100	302,000	345,000	389,000	432,000	475,000	518,000	561,000
1,200	330,000	377,000	424,000	471,000	518,000	565,000	612,000
1,300	357,000	408,000	459,000	510,000	561,000	612,000	663,000
1,400	385,000	440,000	495,000	550,000	604,000	659,000	714,000
1,500	412,000	471,000	530,000	589,000	648,000	707,000	765,000
1,600	440,000	502,000	565,000	628,000	691,000	754,000	816,000
1,700	467,000	534,000	601,000	667,000	734,000	801,000	867,000
1,800	495,000	565,000	636,000	707,000	777,000	848,000	918,000
1,900	522,000	597,000	671,000	746,000	820,000	895,000	969,000
2,000	550,000	628,000	707,000	785,000	864,000	942,000	1,020,000
2,100	....	....	....	824,000	906,000	989,000	1,071,000
2,200	....	....	....	864,000	950,000	1,036,000	1,123,000

Major axis. Miles.	Minor axis. Miles.					
	650.	700.	750.	800.	850.	900.
700	341,000	385,000	....	....	....	....
800	408,000	440,000	471,000	502,000	....	....
900	459,000	495,000	530,000	565,000	601,000	636,000
1,000	510,000	550,000	589,000	628,000	667,000	707,000
1,100	561,000	604,000	648,000	691,000	734,000	777,000
1,200	612,000	659,000	706,000	754,000	801,000	848,000
1,300	663,000	714,000	765,000	816,000	868,000	918,000
1,400	714,000	769,000	824,000	879,000	934,000	989,000
1,500	765,000	824,000	883,000	942,000	1,001,000	1,060,000
1,600	816,000	879,000	942,000	1,005,000	1,068,000	1,130,000
1,700	867,000	934,000	1,001,000	1,068,000	1,134,000	1,201,000
1,800	918,000	989,000	1,060,000	1,130,000	1,201,000	1,272,000
1,900	969,000	1,044,000	1,119,000	1,193,000	1,268,000	1,342,000
2,000	1,020,000	1,099,000	1,178,000	1,256,000	1,334,000	1,413,000
2,100	1,071,000	1,162,000	1,236,000	1,319,000	1,401,000	1,484,000
2,200	1,123,000	1,209,000	1,295,000	1,382,000	1,468,000	1,554,000

Tables XVII, XVIII, XIX, XX, XXI give the highest 7 a. m. temperatures for the months of November and December, January, February, and March that have occurred in each year from 1880 to 1889, inclusive.

In 95 per cent. of the cases where the temperatures were near the greatest temperature that have occurred, there have been falls of 20° on the day following. This change, however, is not of much importance, for the reason that when the temperature is at the maximum the fall is not apt to be any greater than 20°. It seems in most cases to be due to a retardation of an hour or two for some reason or other not understood, in the lowest phase of the diurnal change of temperature.

The mean highest 7 a. m. temperatures for ten years are shown on the charts accompanying, and also their generalization by lines joining the points of equal temperature.

TABLE XVII.—NOVEMBER. GREATEST 7 A. M. TEMPERATURES.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Eastport	57	53	56	53	53	54	60	51	54	50	54
Northfield	....	....	....	....	....	....	....	55	62	58	......
Portland, Me	58	53	60	54	49	54	54	49	56	55	54
Boston	60	56	62	60	54	63	62	61	62	64	60
Nantucket	....	....	....	....	....	....	58	58	58	60	......
Block Island	....	....	....	....	....	61	60	....	58	61	......
Albany	53	63	59	62	46	61	58	50	60	52	56
New York City	57	60	60	62	54	61	62	57	62	63	60
Harrisburg	....	....	....	....	....	—	....	....	68	54	......
Philadelphia	61	61	63	64	56	65	64	62	68	64	63
Atlantic City	60	....	....	....	....	60	61	....	60	60	......
Baltimore	61	65	61	65	53	62	62	52	66	69	62
Washington	62	65	60	61	56	64	67	51	66	58	61
Lynchburgh	58	64	62	66	51	61	63	54	68	67	61
Norfolk	65	67	64	66	63	68	70	60	71	66	66
Charlotte	63	66	62	65	60	63	62	56	68	68	63
Raleigh	....	....	....	....	....	—	....	....	70	68	......
Hatteras	69	72	67	68	65	70	72	65	69	69	69
Wilmington	68	70	64	67	69	70	72	65	72	70	69
Charleston	71	72	68	70	68	69	69	64	74	73	70
Augusta	67	69	65	67	66	68	67	60	71	71	67
Savannah	71	71	61	72	68	71	68	62	74	73	70
Jacksonville	71	72	70	72	67	70	68	70	74	74	70
Titusville	....	....	....	....	....	....	....	....	78	75	......
Pt. Jupiter	....	....	....	....	....	....	....	....	80	79	......
Key West	79	78	78	77	77	77	76	76	81	81	78
Atlanta	64	67	64	66	57	68	63	59	67	63	64
Cedar Keys	71	....	....	....	....	69	68	....	74	74	......
Pensacola	70	73	73	74	67	72	70	68	73	71	71
Mobile	....	70	71	73	65	72	68	65	73	70	70
Montgomery	67	70	67	69	66	72	67	64	71	68	68
Vicksburg	62	69	68	71	61	72	72	66	68	68	68
New Orleans	67	72	74	73	63	75	74	67	71	75	71
Shreveport	61	71	70	71	60	72	69	65	70	61	67
Fort Smith	....	....	74	71	62	64	62	53	71	64	......
Little Rock	60	67	69	70	56	64	68	65	69	62	65
Palestine	....	....	72	72	63	71	70	67	72	63	......
Galveston	69	76	76	75	70	74	72	69	75	71	73
San Antonio	67	69	74	....	....	68	71	69	72	66	......
Corpus Christi	....	....	....	....	....	....	....	....	76	70	......
Brownsville	75	....	....	....	....	75	74	....	75	75	......
Rio Grande City	72	73	....	74	70	71	72	71	72	70	72
Abilene	....	....	....	....	....	57	61	59	69	61	......
Memphis	59	67	68	70	59	65	69	63	69	65	65
Nashville	59	62	65	67	60	66	69	66	66	60	64

TABLE XVII.—NOVEMBER. GREATEST 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Chattanooga	63	56	60	67	64	62	65	61	68	64	63
Knoxville	58	68	61	67	67	59	68	56	62	60	63
Louisville	59	66	65	66	60	67	57	57	66	60	62
Indianapolis	52	58	63	63	56	59	55	51	68	57	58
Cincinnati	58	60	64	66	58	64	56	64	66	63	62
Columbus	55	56	60	60	55	63	61	60	64	64	60
Parkersburgh	....	....	....	....	....	—	....	....	66	68	......
Pittsburgh	61	65	64	62	60	67	61	62	66	65	63
Oswego	55	63	59	69	48	60	54	58	63	49	58
Rochester	57	56	59	66	52	63	56	58	66	50	58
Buffalo	57	57	62	59	55	63	56	58	64	57	59
Erie	57	56	64	62	55	65	58	62	66	60	60
Cleveland	59	55	64	61	56	62	58	62	66	63	61
Sandusky	58	57	63	60	56	65	56	63	62	66	61
Toledo	57	57	63	61	55	63	54	62	66	60	60
Detroit	55	62	62	58	49	63	55	58	62	60	58
Port Huron	55	56	58	55	51	61	55	59	60	57	57
Alpena	51	49	56	50	44	49	53	52	57	46	51
Sault Ste. Marie	....	....	....	....	....	—	....	....	45	40	......
Marquette	48	52	49	51	48	43	60	47	42	40	48
Escanaba	48	51	52	48	40	45	53	46	—	—	......
Green Bay	....	51	52	48	40	45	54	46	52	45	48
Manistee	—	—	—	—	—	—	—	—	57	49	......
Grand Haven	51	56	60	59	51	58	56	50	57	51	55
Milwaukee	50	54	64	57	44	55	52	48	59	48	53
Chicago	54	56	64	58	48	59	53	47	58	46	54
Duluth	40	52	45	48	44	36	50	48	44	39	45
St. Paul	43	49	46	50	46	40	57	44	48	40	46
La Crosse	51	54	58	57	47	48	58	53	57	41	54
Dubuque	50	54	63	58	46	48	58	52	59	44	53
Davenport	54	57	64	57	51	51	57	50	60	48	55
Des Moines	46	52	52	60	49	53	59	53	64	43	53
Keokuk	52	60	66	59	53	57	59	50	62	47	57
Springfield, Ill	54	56	64	59	54	60	54	45	61	48	56
Cairo	58	66	66	68	54	60	60	60	68	66	62
St. Louis	52	61	66	64	55	64	61	52	66	52	59
Springfield, Mo	....	....	....	....	....	—	....	....	66	—	......
Leavenworth	....	61	69	66	66	62	61	52	66	44	61
Wichita	....	....	....	....	....	—	....	....	64	44	......
Concordia	....	....	....	....	....	53	60	51	62	41	......
Omaha	43	56	55	55	45	55	60	53	63	41	53
Yankton	39	46	56	44	43	40	50	50	48	38	45
Valentine	....	....	....	....	....	43	42	42	44	45	......
Huron	....	41	50	40	34	35	50	42	41	38	41
Fort Sully	....	....	....	....	....	—	....	....	42	48	......
Moorhead	....	36	44	38	34	33	58	40	36	34	39
St. Vincent	36	35	37	35	34	34	37	35	33	40	36
Bismarck	38	40	44	37	35	36	47	45	36	40	40
Fort Buford	40	42	36	41	38	42	41	40	37	40	40
Fort Assinniboine	50	45	44	47	50	52	41	57	50	48	48
Helena	47	45	40	50	52	53	50	53	39	44	47
Poplar River	....	....	....	31	30	39?	36	38	34	....	......
Fort Custer	46	45	43	49	45	44	49	53	52	43	47
Rapid City	—	....	....	....	....	—	....	....	41	52	......
Salt Lake City	44	52	51	46	44	58	41	54	54	50	49

TABLE XVII.—NOVEMBER. GREATEST 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Cheyenne	46	43	40	50	40	51	—	41	43	44	......
North Platte	41	42	52	40	39	46	43	40	44	38	42
Denver	44	48	54	48	47	56	54	40	52	47	49
Pike's Peak	22	18	22	24	22	23	18	26	—	—	22
Montrose	....	....	....	....	....	40	43	46	43	—	......
Las Animas	....	40	35	40	43	54	....	....	....	....	......
Pueblo	....	....	....	....	....	—	....	....	64	54	......
Dodge City	43	48	52	47	48	54	54	46	61	45	50
Fort Elliott	43	49	57	51	51	53	55	57	60	49	53
Fort Sill	57	60	65	....	55	54	58	49	68	45	56
Santa Fé	42	36?	49	....	....	55	40	45	46	39	......
Lamar, Mo	....	....	....	....	....	....	....	....	65	47	......
Kansas City	....	....	....	....	....	65	64	57	71	....	......

TABLE XVIII.—DECEMBER. GREATEST 7 A. M. TEMPERATURES.

Eastport	42	47	47	44	46	52	47	47	48	48	47
Northfield	....	....	....	....	....	....	....	39	49	45	......
Portland, Me	44	49	47	46	50	49	42	48	48	49	47
Boston	40	60	52	49	50	59	43	57	55	56	52
Nantucket	....	....	....	....	....	....	48	51	49	54	......
Block Island	....	....	54	52	56	53	48	55	52	55	......
Albany	39	60	48	54	50	44	38	44	50	52	48
New York City	43	59	46	50	49	54	41	53	51	54	50
Harrisburg	....	....	....	....	....	....	....	....	50	52	......
Philadelphia	45	60	48	53	53	49	40	56	54	53	51
Atlantic City	49	53	49	50	51	49	44	51	49	50	50
Baltimore	49	61	46	51	49	50	40	51	52	55	50
Washington	48	59	45	49	56	50	41	51	54	56	51
Lynchburgh	53	62	46	54	57	48	40	53	52	61	53
Norfolk	67	63	54	61	66	62	51	60	61	58	60
Charlotte	59	63	51	58	64	61	52	56	55	58	......
Raleigh	....	....	....	....	....	....	....	59	60	60	......
Hatteras	60	65	60	60	68	65	59	62	59	61	62
Wilmington	65	66	59	64	69	66	57	63	63	60	63
Charleston	63	63	60	64	68	65	58	58	61	61	62
Augusta	64	63	54	64	69	64	55	58	56	60	61
Savannah	65	64	63	65	70	68	56	60	60	58	63
Jacksonville	68	68	65	67	71	68	61	64	62	61	66
Titusville	....	....	....	....	....	....	....	70	66	65	......
Pt. Jupiter	....	....	....	....	....	....	....	....	74	76	......
Key West	78	76	74	74	75	75	72	76	77	74	75
Atlanta	62	64	50	58	64	60	51	52	52	58	57
Cedar Keys	70	69	62	68	68	61	60	64	60	66	65
Pensacola	70	70	64	68	65	65	62	66	62	68	66
Mobile	68	66	67	68	64	62	60	61	64	68	65
Montgomery	68	64	59	66	67	59	56	59	59	62	62
Vicksburg	69	64	60	67	66	68	55	64	59	65	64
New Orleans	70	66	68	70	68	66	62	65	62	64	66
Shreveport	65	65	60	66	61	67	60	64	59	66	3
Fort Smith	....	....	54	59	54	58	45	57	56	66	56

TABLE XVIII.—DECEMBER. GREATEST 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Little Rock	57	64	58	65	58	61	51	61	56	67	60
Palestine	....	59?	64	67	64	66	59	67	62	67	64
Galveston	67	68	66	70	68	69	64	68	66	69	68
San Antonio	67	68	60	....	....	66	62	68	64	68	65
Corpus Christi	....	....	....	....	....	....	....	....	68	72	......
Brownsville	72	72	71	70	72	71	70	72	68	72	71
Rio Grande City	71	70	....	67	70	67	67	68	63	68	68
Abilene	....	....	....	....	....	61	55	62	60	62	......
Memphis	57	62	56	60	58	60	54	56	53	68	58
Nashville	59	60	51	60	58	56	54	57	57	64	58
Chattanooga	57	63	47	56	62	55	52	53	54	65	56
Knoxville	65	63	44	56	59	58	49	52	54	61	56
Louisville	60	59	51	59	56	58	46	55	53	65	56
Indianapolis	50	52	46	55	54	49	45	54	46	62	51
Cincinnati	60	59	48	59	65	53	48	54	47	63	56
Columbus	55	56	44	52	55	60	45	50	43	58	52
Parkersburgh	....	....	....	....	....	....	....	....	45	63	......
Pittsburgh	56	65	43	57	56	53	49	52	48	61	54
Oswego	38	54	40	54	51	48	40	44	46	53	47
Rochester	40	53	39	52	56	49	41	48	47	53	48
Buffalo	41	48	41	51	54	47	42	48	45	49	47
Erie	45	54	41	47	60	51	44	50	49	54	50
Cleveland	54	56	41	49	59	51	47	56	45	58	51
Sandusky	51	54	43	52	59	50	45	53	47	60	51
Toledo	51	54	45	50	56	47	44	53	46	56	50
Detroit	45	54	46	53	56	50	42	49	44	54	49
Port Huron	44	46	38	48	51	44	38	51	43	51	45
Alpena	37	36	35	41	48	35	41	39	42	42	40
Sault Ste. Marie	....	....	....	....	....	....	....	....	42	39	......
Marquette	34	37	35	43	40	40	36	42	39	36	38
Escanaba	37	36	34	41	37	38	36	41	....	....	38
Green Bay	....	....	....	....	....	....	37	40	43	40	......
Manistee	....	....	....	....	....	....	....	....	42	52	......
Grand Haven	43	46	39	54	49	42	41	49	42	53	46
Milwaukee	37	43	42	52	44	42	39	41	43	55	44
Chicago	38	55	38	52	52	46	46	49	45	61	48
Duluth	34	37	32	39	35	37	32	34	42	36	36
St. Paul	34	37	33	39	34	40	38	34	50	38	38
La Crosse	32	44	35	50	36	44	43	36	48	42	41
Dubuque	34	43	39	52	42	42	39	37	49	57	43
Davenport	37	48	39	53	44	46	42	38	46	58	45
Des Moines	36	45	42	45	39	49	44	37	53	60	45
Keokuk	40	55	40	51	43	46	46	41	50	59	47
Springfield, Ill	40	58	42	54	55	52	49	43	52	59	50
Cairo	51	60	49	58	57	55	49	57	54	66	56
St. Louis	42	60	41	59	60	60	55	46	52	62	55
Springfield, Mo	....	....	53	....	....	....	....	....	52	....	......
Leavenworth	37	51	47	53	42	50	46	43	54	59	48
Kansas City	....	....	....	....	....	....	....	....	55	61	......
Lamar	....	....	....	....	....	53	44	58	50	....	......
Wichita	....	....	....	....	....	....	....	....	55	59	......
Concordia	....	....	....	....	....	52	48	42	56	57	......
Omaha	34	47	43	51	36	50	45	42	52	60	46
Yankton	30	35	41	41	34	43	42	36	43	41	39
Valentine	....	....	....	....	....	36	44	40	39	44	......

TABLE XVIII.—DECEMBER. GREATEST 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Fort Buford	35	35	33	38	38	35	32	34	45	31	36
Huron	.....	37	31	44	32	38	32	35	43	40	37
Fort Sully	.....	.....	.....	.....	32	45	32	39	48	38	......
Moorhead	.....	30	26	38	40	33	25	30	39	35	33
St. Vincent	32	26	25	31	35	31	31	29	32	34	31
Bismarck	42	42	31	39	41	38	26	35	42	35	37
Fort Assinniboine	44	49	42	44	48	56	44	41	50	36	45
Helena	40	45	42	46	44	44	46	46	44	36	43
Poplar River	.....	.....	—	31	30	29	24	25	50	—	......
Fort Custer	38	40	45	39	44	54	43	41	45	34	42
Rapid City	.....	.....	.....	.....	.....	.....	.....	.....	42	51	......
Salt Lake City	42	44	46	46	48	46	46	45	41	51	46
Cheyenne	48	46	46	50	43	47	—	41	34	45	45
North Platte	33	40	38	47	42	46	36	36	38	38	39
Denver	44	50	50	49	48	45	54	48	42	52	48
Pike's Peak	21	20	22	27	21	26	17	19	—	—	22
Montrose	.....	.....	.....	.....	.....	35	38	38	36	—	......
Pueblo	.....	.....	.....	.....	.....	.....	.....	.....	48	52	......
Dodge City	34	44	34	45	36	52	43	42	48	50	43
Fort Elliott	47	40	44	51	45	53	43	46	48	54	47
Fort Sill	57	58	42	.....	46	53	49	61	55	58	53
Santa Fé	35	—	36	.....	41	37	33	36	35	50	38
Las Animas	.....	42	28	40	44	42	34	36	.....	.....	......

TABLE XIX.—JANUARY. GREATEST 7 A. M. TEMPERATURES.

Eastport	43	38	41	36	38	46	43	46	46	44	42
Northfield	.....	.....	.....	.....	.....	.....	.....	.....	29	44	......
Portland, Me	47	35	40	39	38	51	47	44	37	45	42
Boston	50	41	49	42	39	55	49	52	45	41	46
Nantucket	.....	.....	.....	.....	.....	.....	.....	49	45	47	......
Block Island	.....	.....	.....	44	49	56	51	51	45	50	......
Albany	40	41	45	41	45	52	55	47	35	52	45
New York City	49	39	47	41	43	52	48	51	47	53	47
Harrisburg	.....	.....	.....	.....	.....	.....	.....	.....	—	51	......
Philadelphia	50	42	50	46	48	57	53	54	50	56	51
Atlantic City	53	45	50	42	44	50	46	47	45	50	47
Baltimore	51	41	51	44	46	58	51	50	44	59	50
Washington	50	39	51	41	44	57	54	53	45	57	49
Lynchburgh	53	40	52	44	49	58	59	56	58	58	53
Norfolk	59	57	59	58	56	68	59	62	60	60	60
Charlotte	54	50	58	53	53	60	62	57	60	59	57
Raleigh	.....	.....	.....	.....	.....	.....	.....	61	60	63	......
Hatteras	63	54	63	56	63	65	58	61	60	62	60
Wilmington	66	57	63	64	62	67	65	61	64	65	63
Charleston	65	59	63	61	59	64	62	60	62	61	62
Augusta	61	53	66	63	60	63	61	60	66	62	62
Savannah	63	58	65	64	64	66	64	60	63	60	63
Jacksonville	65	60	67	66	67	68	66	64	65	64	65
Titusville	.....	.....	.....	.....	.....	.....	.....	.....	68	69	......
Pt. Jupiter	.....	.....	.....	.....	.....	.....	.....	.....	74	74	......

TABLE XIX.—JANUARY. GREATEST 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Terms.
Key West	75	74	74	76	74	74	73	74	75	75	74
Atlanta	61	50	64	57	55	57	58	58	61	53	57
Cedar Keys	67	63	68	64	66	66	60	61	66	64	64
Pensacola	65	64	67	66	61	68	66	63	64	63	65
Mobile	63	64	67	66	61	65	62	65	64	62	64
Montgomery	64	63	68	66	60	68	64	61	62	57	63
Vicksburg	68	63	69	59	62	60	66	63	66	67	64
New Orleans	67	64	70	71	62	68	68	69	68	66	67
Shreveport	68	62	66	63	62	60	59	64	66	58	63
Fort Smith	....	....	....	50	62	42	52	63	62	52	......
Little Rock	67	53	64	60	62	53	52	62	66	57	60
Palestine	....	....	66?	62	64	58	64	65	69	64	64
Galveston	68	60	67	63	60	65	65	62	63	62	64
San Antonio	68	63	68	65	....	....	64	66	68	66	66
Corpus Christi	....	....	....	....	....	....	....	....	68	69	......
Brownsville	73	68	72	68	67	68	69	69	70	70	69
Rio Grande City	71	66	68	....	67	67	65	65	67	66	67
Abilene	....	....	....	....	....	....	54	58	63	60	......
Memphis	65	51	62	58	59	54	54	60	67	56	59
Nashville	64	46	61	58	54	51	57	60	66	53	57
Chattanooga	60	46	66	58	62	58	54	59	62	53	58
Knoxville	56	46	59	58	59	56	52	63	60	51	56
Louisville	61	44	57	55	53	50	53	56	57	52	54
Indianapolis	60	42	50	42	51	47	51	55	58	48	50
Cincinnati	61	44	55	54	51	52	49	54	62	48	53
Columbus	57	38	48	45	40	46	46	50	57	47	47
Parkersburgh	....	....	....	....	....	....	....	....	—	52	......
Pittsburgh	58	43	53	48	46	56	54	56	59	54	53
Oswego	48	32	41	41	38	51	42	46	38	52	43
Rochester	52	36	41	36	33	50	52	48	41	47	43
Buffalo	53	35	43	38	34	42	54	49	46	41	43
Erie	60	38	50	46	39	46	53	52	54	43	48
Cleveland	59	38	52	47	43	48	51	53	48	44	48
Sandusky	55	39	50	44	44	46	50	54	46	46	47
Toledo	53	39	51	44	44	46	47	55	40	48	47
Detroit	50	34	48	39	44	48	49	50	38	45	45
Port Huron	46	33	43	35	37	36	48	45	40	40	40
Alpena	37	25	35	27	35	32	37	32	36	35	33
Sault Ste. Marie	....	....	....	....	....	....	....	....	—	33	......
Marquette	45	27	36	24	32	33	30	30	25	37	32
Escanaba	38	25	35	28	34	30	33	31	30	—	31
Green Bay	....	....	....	....	....	....	....	37	32	39	......
Manistee	....	....	....	....	....	....	....	....	....	40	......
Grand Haven	56	37	44	37	41	37	37	44	34	43	41
Milwaukee	47	28	41	35	44	36	39	40	35	41	39
Chicago	57	37	48	38	44	41	42	47	39	46	44
Duluth	37	27	30	17	31	26	28	20	27	35	28
St. Paul	41	29	33	22	41	28	29	26	22	38	31
La Crosse	49	25	37	34	38	33	34	37	31	41	36
Dubuque	47	28	41	33	39	34	35	36	35	42	37
Davenport	55	35	48	34	46	38	44	41	38	46	42
Des Moines	53	33	42	27	36	35	34	36	31	42	35
Keokuk	59	37	48	32	52	41	48	52	36	49	45
Springfield, Ill	60	40	51	42	51	41	52	56	41	51	48
Cairo	63	48	59	49	58	49	54	60	66	53	55

TABLE XIX.—JANUARY. GREATEST 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
St. Louis	59	42	53	46	57	50	56	58	59	52	53
Springfield, Mo	....	....	65	40	....	....	....	....	58	52	......
Leavenworth	54	37	54	31	37	36	32	56	45	44	43
Kansas City	....	....	....	....	....	....	....	....	—	47	......
Lamar	....	....	....	....	....	....	49	60	55	—	......
Wichita	....	....	....	....	....	....	....	....	—	44	......
Concordia	....	....	....	....	....	....	36	43	36	34	......
Omaha	53	32	43	30	37	34	33	32	33	38	37
Yankton	45	29	38	26	37	42	33	35	30	33	35
Valentine	....	....	....	....	....	....	41	36	37	32	......
Fort Buford	42	27	30	38	32	38	15	23	41	27	31
Huron	....	....	32	25	39	41	22	27	24	31	30
Fort Sully	....	....	....	....	....	....	27	29	29	34	......
Moorhead	....	25	35	10	37	34	12	15	23	30	25
St. Vincent	....	22	23	10	31	25	6	20	14	27	20
Bismarck	44	26	27	38	35	34	18	21	29	32	30
Fort Assinniboine	....	40	36	39	41	43	42	41	43	38	40
Helena	....	44	37	39	32?	47	42	44	44	32	40
Poplar River	....	....	....	—	35	28	14	18	10	28	......
Fort Custer	49	39	35	....	40	47	39	43	42	31	41
Rapid City	....	....	....	....	....	....	....	....	41	45	......
Salt Lake City	41	49	43	40	42	44	47	49	45	38	44
Cheyenne	44	45	49	38	41	44	42	....	43	35	42
North Platte	40	35	30	36	36	32	39	33	30	30	34
Denver	49	55	43	48	50	53	51	62	53	28	49
Montrose	....	....	....	....	....	....	40	42	42	—	......
Las Animas	....	....	27?	39	34	38	36	38	59	....	......
Pueblo	....	....	....	....	....	....	....	....	....	34	......
Pike's Peak	19	15	19	16	18	15	13	16	20	—	17
Dodge City	48	32	40	33	42	33	39	45	47	34	39
Fort Elliott	55	42	41	40	48	44	44	55	51	47	47
Fort Sill	66	42	53	42	....	40	41	60	54	50	50
Santa Fé	31	34	34	39	....	32	36	42	41	36	36

TABLE XX.—FEBRUARY. GREATEST 7 A. M. TEMPERATURES.

Eastport	40	40	41	40	35	32	45	40	42	44	40
Northfield	....	....	....	....	....	....	....	....	42	34	......
Portland, Me	45	41	43	39	41	41	44	38	41	34	41
Boston	55	46	44	50	45	44	54	44	46	42	47
Nantucket	....	....	....	....	....	....	....	46	42	40	......
Block Island	....	....	....	45	50	49	48	44	39	44	......
Albany	48	47	49	44	51	38	39	38	38	36	43
New York City	51	46	48	55	52	44	46	51	43	42	48
Harrisburg	....	....	....	....	....	....	....	....	—	34	......
Philadelphia	55	53	46	59	61	42	44	52	49	39	50
Atlantic City	55	45	50	46	48	45	40	43	47	44	46
Baltimore	58	51	55	62	63	41	42	59	64	38	53
Washington	58	57	54	62	61	40	43	58	46	38	52
Lynchburgh	61	59	62	64	62	43	43	58	50	42	54
Norfolk	63	65	61	62	66	63	49	62	58	61	61

TABLE XX.—FEBRUARY. GREATEST AT 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Charlotte	63	57	62	64	62	52	52	57	57	63	59
Raleigh	....	....	....	....	....	....	....	59	56	66	......
Hatteras	62	54	65	59	65	62	57	58	61	64	61
Wilmington	67	64	63	66	66	60	62	62	61	63	63
Charleston	65	60	65	66	64	60	60	62	61	63	63
Augusta	64	64	66	67	65	59	59	60	58	70	63
Savannah	65	62	66	66	65	60	61	64	62	65	64
Jacksonville	65	66	68	70	69	65	60	68	69	66	67
Titusville	....	....	....	....	....	....	....	....	70	70	......
Pt. Jupiter	....	....	....	....	....	....	....	....	73	73	......
Key West	74	75	83	75	75	74	72	76	76	77	76
Atlanta	64	61	62	65	62	59	54	63	54	60	60
Cedar Keys	66	65	68	72	70	64	61	70	68	64	67
Pensacola	68	66	67	71	67	63	60	70	68	66	67
Mobile	65	63	67	70	65	56	59	68	65	64	64
Montgomery	68	64	67	69	67	64	62	65	62	69	66
Vicksburg	66	61	70	70	67	66	64	70	62	69	66
New Orleans	68	67	70	72	69	69	66	71	66	70	69
Shreveport	69	60	68	70	68	59	63	69	58	68	65
Fort Smith	....	....	....	64	60	51	50	68	56	60	58
Little Rock	64	59	66	68	66	54	54	65	58	64	62
Palestine	....	....	70	71	68	56	63	68	68	67	66
Galveston	68	65	69	68	66	61	63	68	65	65	66
San Antonio	69	....	68	70	....	....	63	68	63	64	66
Corpus Christi	....	....	....	....	....	....	....	....	68	66	......
Brownsville	73	69	73	71	69	64	70	72	70	69	70
Rio Grande City	72	69	71	....	71	64	68	70	66	69	69
Abilene	....	....	....	....	....	....	56	64	58	60	......
Memphis	66	57	66	67	66	56	54	64	56	62	61
Nashville	60	55	64	67	64	62	54	67	55	63	61
Chattanooga	66	60	59	63	63	58	55	65	54	57	60
Knoxville	66	59	58	65	62	54	58	64	53	58	60
Louisville	61	55	60	64	64	46	48	64	49	61	57
Indianapolis	60	53	56	63	57	37	48	57	48	49	53
Cincinnati	60	56	59	63	62	42	49	63	47	53	55
Columbus	58	51	55	55	57	40	46	63	49	42	52
Parkersburgh	....	....	....	....	....	....	....	....	....	48	......
Pittsburgh	57	53	57	60	60	48	46	64	53	47	55
Oswego	50	47	49	49	48	26	40	39	41	41	43
Rochester	52	43	52	46	48	30	41	44	43	38	44
Buffalo	52	51	50	48	40	30	45	50	47	37	46
Erie	54	50	55	52	46	40	45	56	49	42	49
Cleveland	55	51	53	54	45	40	43	58	52	36	49
Sandusky	56	50	53	57	51	37	44	56	48	36	49
Toledo	53	49	54	53	43	38	43	55	48	35	47
Detroit	50	54	54	54	50	35	46	50	44	34	47
Port Huron	50	47	48	48	40	28	42	46	45	34	43
Alpena	42	35	43	33	32	27	38	46	34	32	36
Sault Ste. Marie	....	....	....	....	....	....	....	....	—	27	......
Marquette	38	35	41	35	36	....	43	31	31	30	36
Escanaba	39	34	38	34	35	29	35	35	33	—	35
Green Bay	....	....	....	....	....	....	....	37	33	34	......
Manistee	....	....	....	....	....	....	....	....	—	32	......
Grand Haven	49	46	49	49	45	32	41	44	34	33	42
Milwaukee	51	38	48	46	41	30	40	46	36	37	41

TABLE XX.—FEBRUARY. GREATEST AT 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Chicago	54	46	51	49	45	37	46	54	45	36	46
Duluth	30	34	38	34	27	31	37	30	33	27	32
St. Paul	39	30	44	34	35	35	35	31	32	31	35
La Crosse	45	34	52	35	35	33	40	31	35	33	37
Dubuque	43	36	46	43	40	36	39	34	38	36	39
Davenport	47	38	53	50	45	38	40	39	43	38	43
Des Moines	53	37	55	37	37	36	41	35	41	42	41
Keokuk	51	42	53	60	42	36	42	50	44	39	46
Springfield, Ill	56	43	55	58	47	42	46	57	46	44	49
Cairo	64	53	63	66	63	47	51	58	52	64	58
St. Louis	60	48	56	64	50	52	52	63	48	54	55
Springfield, Mo	....	....	56	56	....	....	....	....	50	57	......
Leavenworth	57	48	57	44	40	39	47	53	49	47	48
Kansas City	....	....	....	....	....	....	....	....	....	49	......
Lamar	....	....	....	....	....	....	51	64	56	—	......
Wichita	....	....	....	....	....	....	....	....	....	42	......
Concordia	....	....	....	....	....	....	47	47	45	43	......
Omaha	53	39	52	38	38	37	42	35	43	45	42
Yankton	42	35	39	33	38	37	46	35	40	44	39
Valentine	....	....	....	....	....	....	38	31	46	41	......
Fort Buford	32	38	37	22	32	39	35	43	28	29	32
Huron	....	....	38	36	33	36	35	25	32	35	34
Fort Sully	....	....	....	....	....	....	37	36	36	36	......
Moorhead	....	27	34	30	27	33	32	27	34	23	30
St. Vincent	....	27	30	22	18	27	34	22	26	24	26
Bismarck	38	23	39	28	32	39	37	35	31	33	34
Fort Assinniboine	....	44	46	38	39	41	50	40	41	47	43
Helena	....	49	42	44	48	45	52	45	47	52	47
Poplar River	....	....	....	—	24	33	36	31	25	35	......
Fort Custer	38	43	44	....	46	41	41	41	38	39	41
Rapid City	....	....	....	....	....	....	....	....	40	41	......
Salt Lake City	39	49	40	41	41	42	48	48	50	39	44
Cheyenne	35	46	39	33	38	42	45	....	38	43	40
North Platte	36	37	43	35	40	35	37	32	40	40	38
Denver	43	49	46	35	46	49	44	42	46	54	45
Las Animas	....	....	44	....	34	38	37	47	46	....	......
Montrose	....	....	....	....	....	33?	32	43	49	—	......
Pueblo	....	....	....	....	....	....	....	....	—	46	......
Pike's Peak	10	18	10	16	15	11	18	17	17	—	15
Dodge City	52	44	48	39	42	37	46	46	49	40	44
Fort Elliott	48	50	45	45	39	42	49	57	52	50	48
Fort Sill	60	55	55	52	....	42	39	57	55	54	52
Santa Fé	32	40	52	41	....	37	39	44	40	34	40

TABLE XXI.—MARCH. GREATEST 7 A. M. TEMPERATURES.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Eastport	37	39	42	40	42	41	36	37	39	42	40
Northfield	....	....	....	....	....	....	....	34	39	42	......
Portland, Me	43	39	47	41	42	42	39	39	40	46	42
Boston	48	42	48	50	50	44	46	46	48	52	47
Nantucket	....	....	....	....	....	....	....	44	46	49	......

TABLE XXI.—MARCH. GREATEST AT 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Block Island	....	....	....	46	48	49	49	48	46	46	......
Albany	46	41	50	48	48	40	51	36	43	40	44
New York City	53	42	49	46	49	43	50	43	44	49	47
Harrisburg	....	....	....	....	....	....	....	....	—	47	......
Philadelphia	59	43	59	49	55	42	58	44	54	52	52
Atlantic City	51	44	53	45	52	42	49	45	50	47	48
Baltimore	63	46	54	51	56	47	58	44	56	52	53
Washington	64	45	57	48	55	44	63	45	60	50	53
Lynchburgh	63	51	58	50	60	44	64	54	62	53	56
Norfolk	68	55	66	58	62	53	69	55	68	54	61
Charlotte	63	55	63	59	63	59	61	52	60	56	59
Raleigh	....	....	....	....	....	....	....	56	65	52	......
Hatteras	64	56	62	60	65	60	62	65	66	58	62
Wilmington	69	62	65	62	66	62	70	62	67	63	65
Charleston	68	62	67	62	67	61	65	62	65	62	64
Augusta	70	62	70	63	66	61	66	58	70	60	65
Savannah	70	64	69	65	72	65	69	63	67	61	67
Jacksonville	72	69	72	67	73	67	71	66	70	62	69
Titusville	....	....	....	....	....	....	....	....	70	67	......
Pt. Jupiter	....	....	....	....	....	....	....	....	74	71	......
Key West	77	77	77	76	76	76	76	74	76	75	76
Atlanta	65	58	64	62	62	56	63	58	62	56	61
Cedar Keys	74	67	71	69	72	63	70	68	68	63	69
Pensacola	72	68	71	69	70	63	68	68	68	66	68
Mobile	70	68	72	69	68	62	67	65	67	66	67
Montgomery	69	63	68	68	68	66	70	66	69	65	67
Vicksburg	70	65	70	66	70	65	62	64	66	62	66
New Orleans	71	70	73	70	72	69	72	66	71	65	70
Shreveport	70	64	70	65	69	68	62	66	65	66	66
Fort Smith	....	....	....	52	66	54	59	55	60	64	59
Little Rock	68	59	71	65	65	57	61	60	63	64	63
Palestine	....	....	83	67	67	66	62	65	65	68	68
Galveston	....	67	72	70	70	67	67	69	66	66	69
San Antonio	74	67	70	70	....	68	64	67	66	68	68
Corpus Christi	....	....	....	....	....	....	....	70	70	69	......
Brownsville	77	74	75	74	73	72	70	70	72	70	73
Rio Grande City	73	71	74	....	73	73	71	71	70	70	72
Abilene	....	....	....	....	....	....	61	64	62	66	......
Memphis	66	60	70	64	66	55	64	59	60	64	63
Nashville	68	58	66	59	62	54	63	59	62	63	61
Chattanooga	66	58	66	64	61	56	63	59	60	62	62
Knoxville	66	55	63	62	60	55	58	55	57	54	58
Louisville	64	53	63	55	60	54	62	57	62	63	59
Indianapolis	57	51	58	47	57	47	59	51	55	60	54
Cincinnati	61	53	62	57	58	48	60	56	57	62	57
Columbus	56	47	58	47	53	43	59	54	52	50	52
Parkersburgh	....	....	....	....	....	....	....	....	—	64	......
Pittsburgh	58	52	58	54	56	47	61	56	59	50	55
Oswego	53	40	45	47	49	42	56	37	44	46	46
Rochester	54	43	53	44	49	43	57	42	50	45	48
Buffalo	46	45	52	44	52	42	51	43	48	44	47
Erie	54	47	56	48	53	45	53	50	53	47	51
Cleveland	53	40	57	46	55	44	58	52	52	50	51
Sandusky	51	38	56	45	52	44	58	48	51	49	49
Toledo	50	38	58	46	52	42	56	46	52	44	48

TABLE XXI.—MARCH. GREATEST AT 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Detroit	48	42	49	49	51	44	44	42	48	44	46
Port Huron	46	36	51	35	46	35	40	38	48	42	42
Alpena	40	32	40	33	38	31	33	35	35	44	36
Sault Ste. Marie	.....	.....	.....	.....	.....	.....	.....	.....	—	38	.....
Marquette	40	34	40	37	42	35	35	32	38	41	37
Escanaba	35	32	36	32	37	34	36	32	36	—	35
Green Bay	.....	.....	.....	.....	.....	.....	.....	37	39	42	.....
Manistee	.....	.....	.....	.....	.....	.....	.....	.....	—	44	.....
Grand Haven	52	37	46	37	49	39	40	.....	49	43	43
Milwaukee	43	33	48	40	44	39	38	41	50	43	42
Chicago	49	36	50	45	46	44	51	44	51	46	46
Duluth	37	34	37	36	37	35	35	33	29	46	36
St. Paul	43	37	42	35	48	42	38	38	34	38	40
La Crosse	48	40	48	39	48	40	43	40	36	44	43
Dubuque	52	34	48	49	48	42	38	40	58	47	45
Davenport	55	34	53	48	50	43	52	45	55	48	48
Des Moines	53	37	49	41	47	48	44	53	41	34	45
Keokuk	57	42	56	49	56	47	58	49	57	46	52
Springfield, Ill	58	46	57	51	52	49	58	50	55	53	53
Cairo	63	60	66	57	63	51	62	57	62	64	60
St. Louis	61	56	64	51	58	54	63	60	60	61	59
Springfield, Mo	.....	.....	66	49	.....	.....	.....	.....	56	60	.....
Leavenworth	60	45	60	53	54	47	58	51	57	51	54
Kansas City	.....	.....	.....	.....	.....	.....	.....	.....	—	51	.....
Lamar	.....	.....	.....	.....	.....	51	60	61	57	—	.....
Wichita	.....	.....	.....	.....	.....	.....	.....	.....	—	51	.....
Concordia	.....	.....	.....	.....	.....	.....	49	50	49	51	.....
Omaha	50	37	58	46	55	47	44	50	42	51	48
Yankton	51	38	48	38	44	43	44	44	43	42	44
Valentine	.....	.....	.....	.....	.....	.....	42	44	40	41	.....
Fort Buford	35	35	40	43	36	40	39	45	37	38	39
Huron	.....	.....	38	38	41	39	46	38	37	21	37
Fort Sully	.....	.....	.....	.....	.....	.....	44	54	37	45	.....
Moorhead	.....	32	35	32	35	37	39	34	32	43	35
St. Vincent	.....	30	29	32	32	29	37	34	31	38	32
Bismarck	38	33	44	38	38	39	40	38	43	43	39
Fort Assinniboine	.....	45	45	41	33	45	45	44	45	44	43
Helena	.....	50	47	46	37	47	45	51	43	44	46
Poplar River	.....	.....	.....	.....	35?	34	43	34	36	39	.....
Fort Custer	45	42	54	.....	36	47	41	49	39	46	44
Rapid City	.....	.....	.....	.....	.....	.....	.....	.....	45	47	.....
Salt Lake City	46	52	46	56	46	48	45	55	54	53	50
Cheyenne	36	46	44	36	36	40	42	49?	40	43	41
North Platte	44	39	46	37	46	35	42	40	34	42	41
Denver	46	43	55	50	44	40	45	45	40	42	45
Montrose	.....	.....	.....	.....	.....	38	40	47	41	—	.....
Las Animas	.....	.....	55	43	53	40	49	48	54	.....	.....
Pueblo	.....	.....	.....	.....	.....	.....	.....	.....	—	52	.....
Pike's Peak	13	17	18	17	11	15	21	24	18	—	17
Dodge City	60	47	52	50	55	44	44	44	49	47	49
Fort Elliott	65	47?	60	48	56	53	55	52	55	49	54
Fort Sill	65	54	66	59	.....	55	57	55	57	61	59
Santa Fé	28	41	48	46	.....	41	42	42	40	43	41

Form 106 F CHART B.

November

Mean highest 7. A. M. Temperatures 1880 to 1890

APPENDIX No. 5

Form 106 F. CHART. C.

December

Mean highest 7 A.M. Temperatures 1880 to 1890

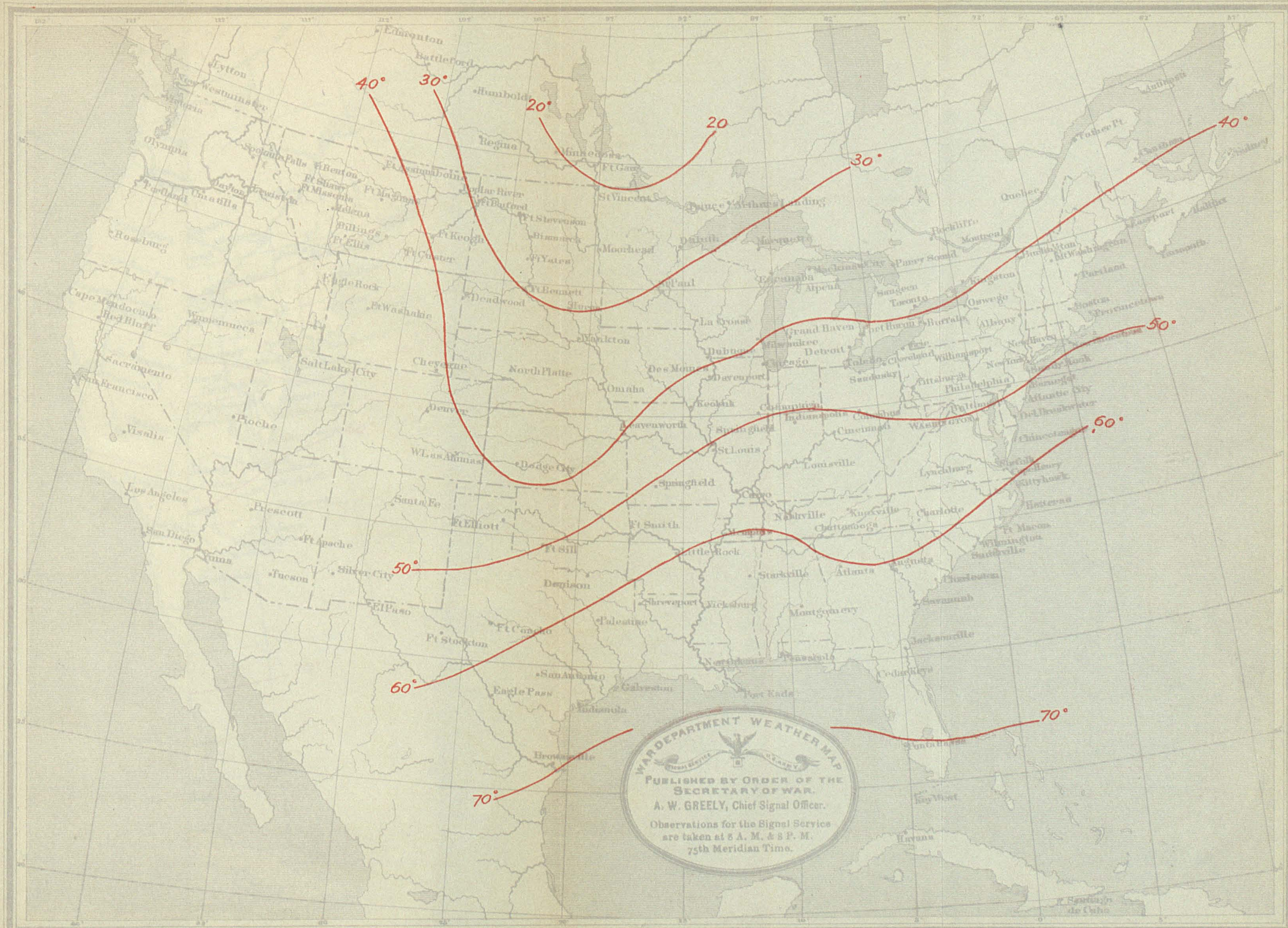
APPENDIX No. 5

Form 106 F. CHART D.

January

Mean highest 7 A.M. Temperatures 1880 to 1890.

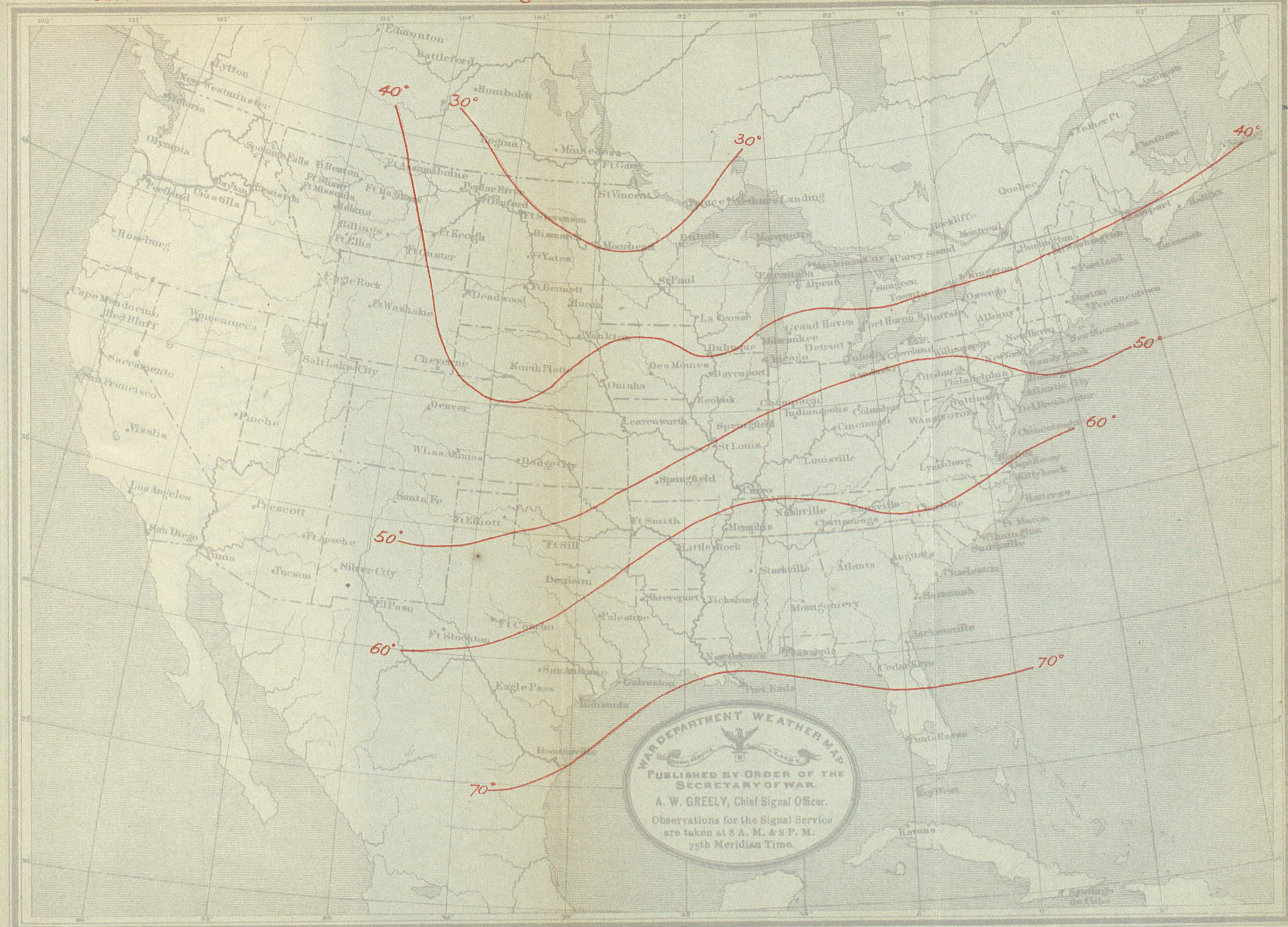
Appendix No.5



Form 106 F. CHART E.

February
Mean highest 7 A.M. Temperatures 1880 to 1890

Appendix No. 5



Form 106 F. CHART. F

March

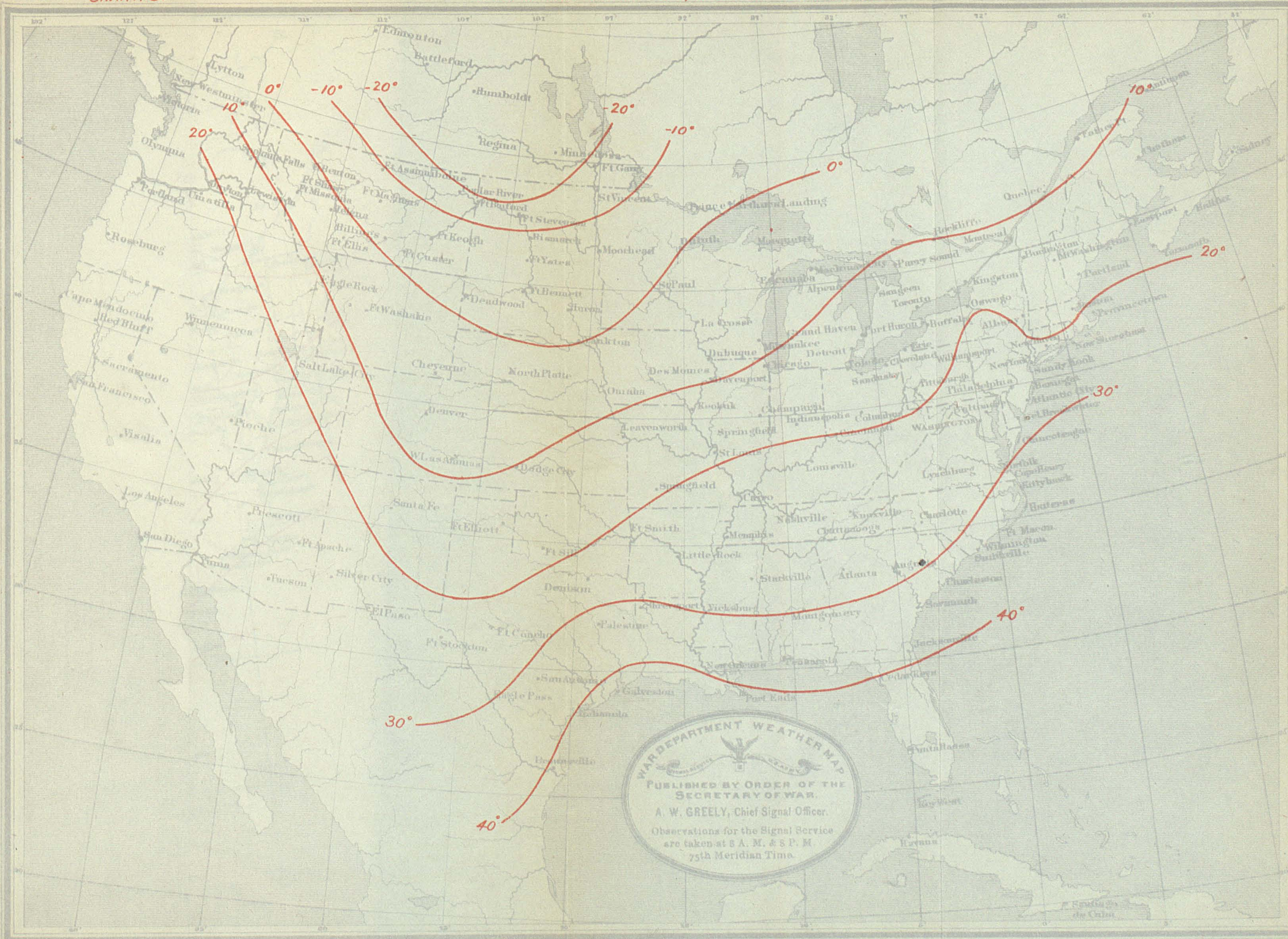
Mean highest 7.A.M. Temperatures 1880 to 1890

Appendix No. 5.

Form 106 F. CHART. G.

November

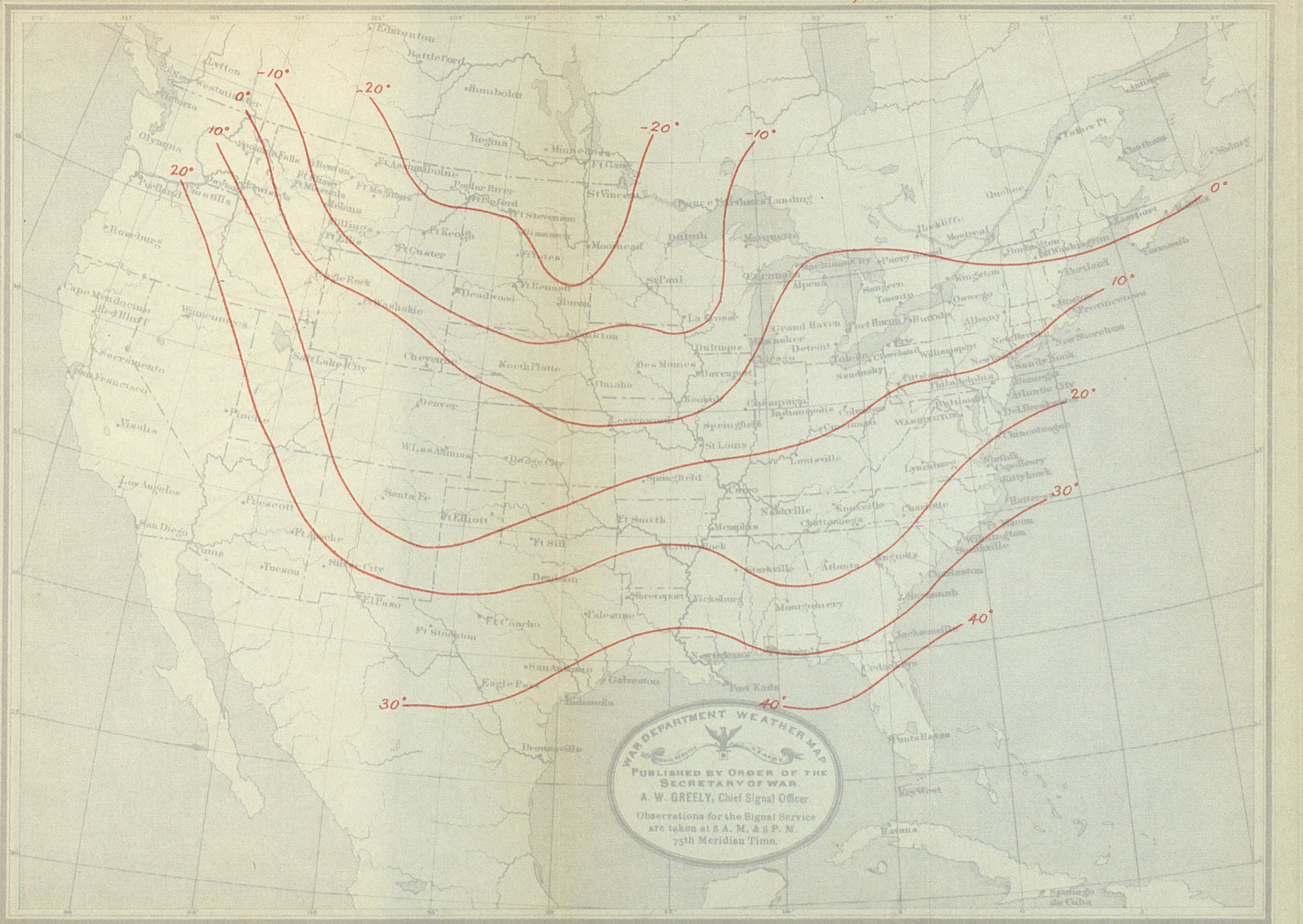
Mean lowest 7. A. M. Temperatures 1880 to 1890



Form 106 F CHART. H

December
Mean lowest 7 A.M. Temperatures 1880 to 1890.

APPENDIX No. 5.

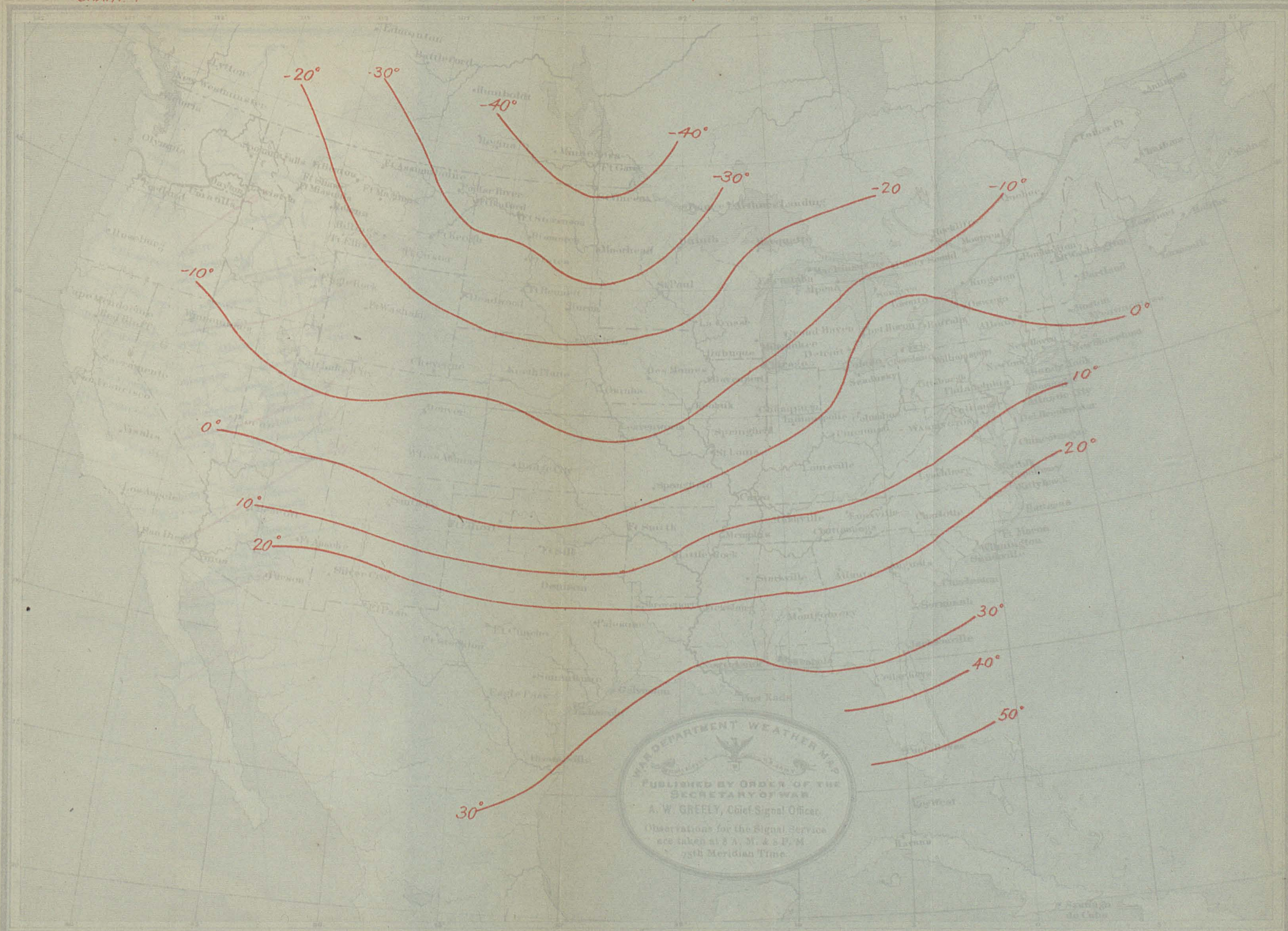


Form 106 F CHART 1

January

Mean lowest 7 A.M. Temperatures 1880 to 1890.

APPENDIX No. 5

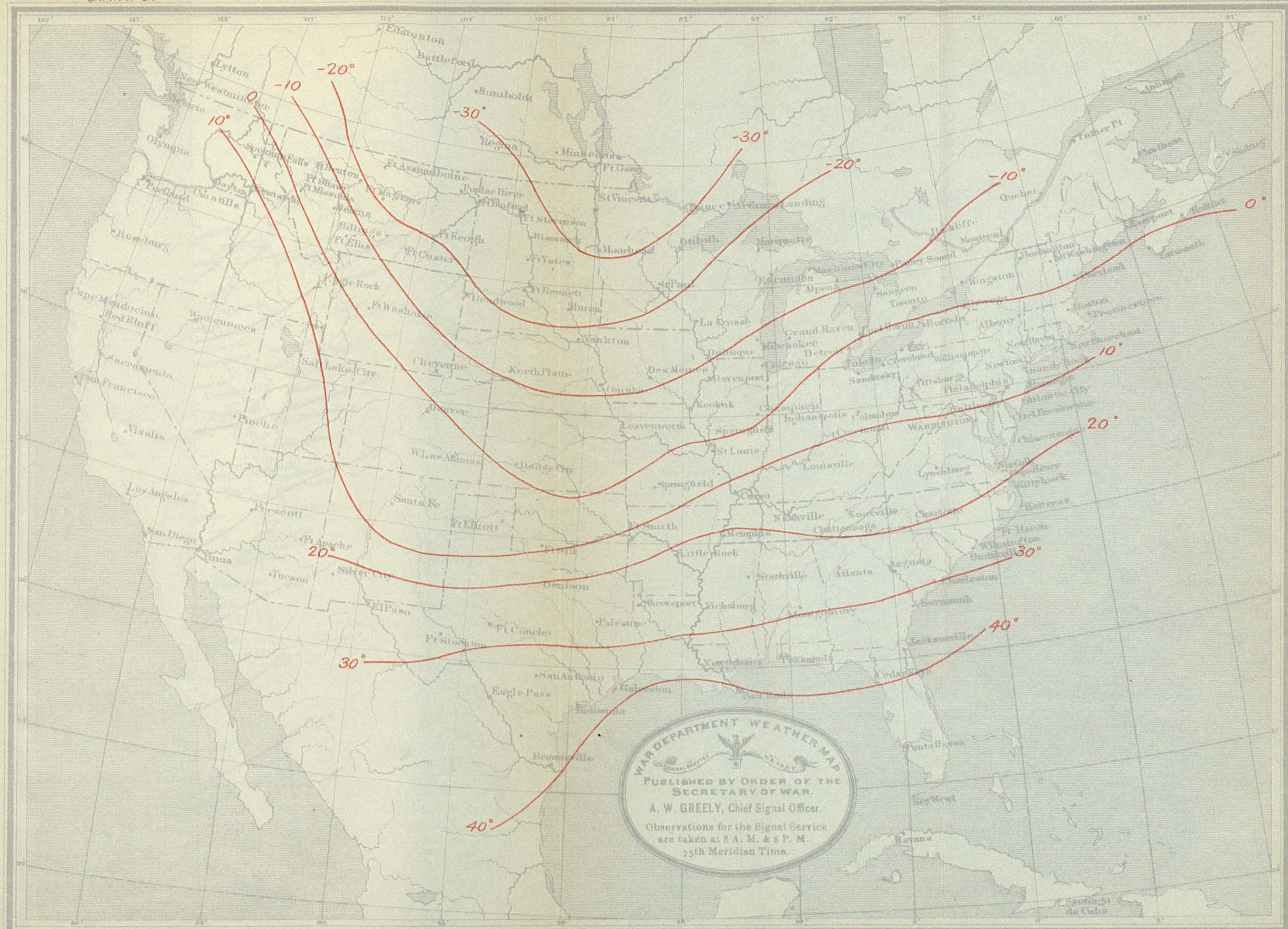


Form 106 F. CHART. J.

February

Mean lowest 7 A. M. Temperatures 1880 to 1890

APPENDIX No. 5

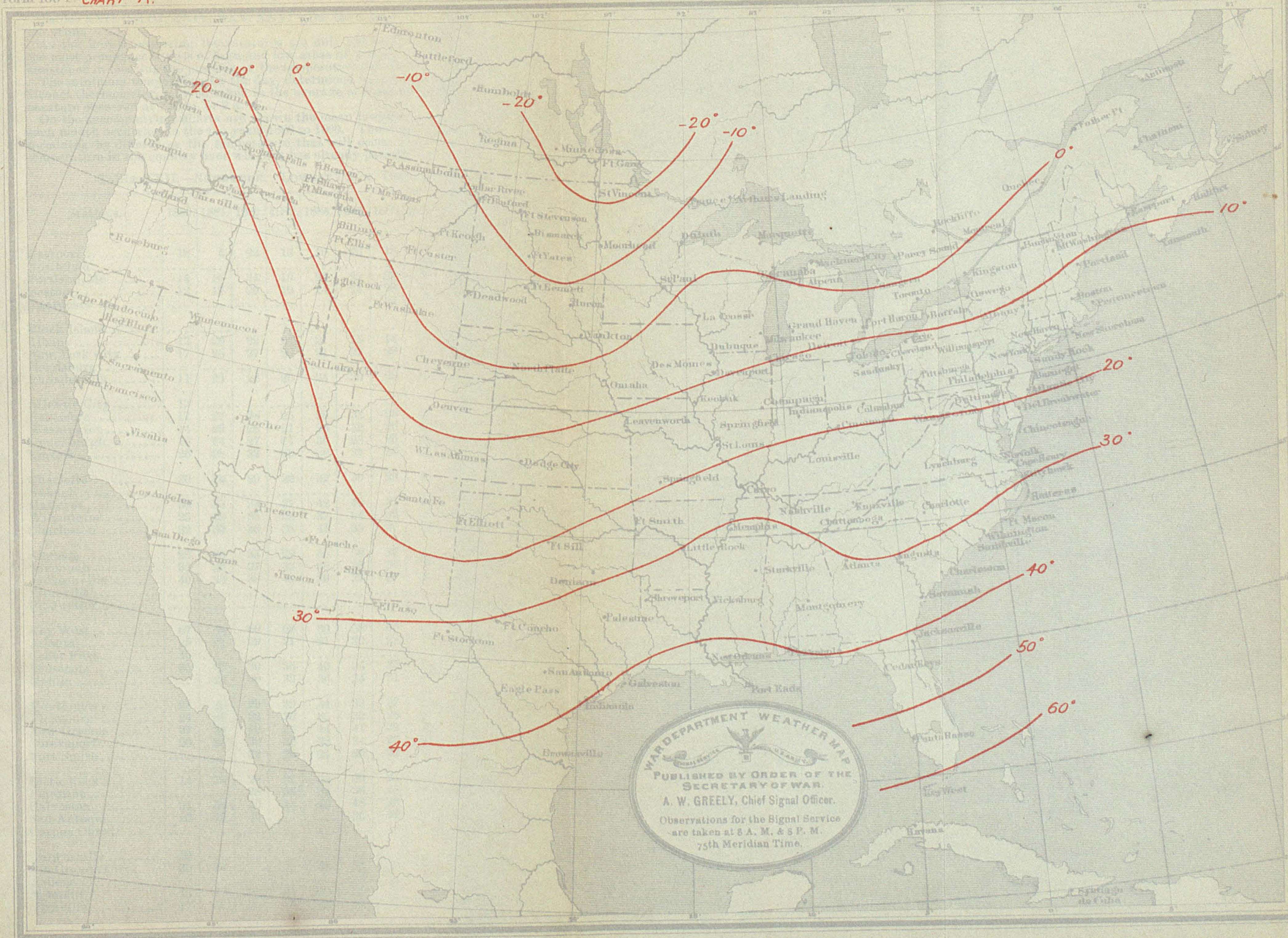


Form 106 F *CHART K.*

March.

Mean lowest 7 A.M. Temperatures 1880 to 1890

APPENDIX No. 5



Tables XXII, XXIII, XXIV, XXV, XXVI give the lowest 7 a. m. temperature for ten years.

As the lowest occurring temperatures are only apt to take place some time after the most pronounced types of high and low areas of pressure, these tables will be of assistance in locating the position of the temperature-fall areas.

The minimum temperature for the day, determined by means of the self-registering alcohol thermometer, may be taken in the average of cases as 3° lower than the temperature observed at 7 a. m. or 8 a. m.

On the accompanying charts are shown the mean lowest 7 a. m. temperatures for each month occurring in the ten years 1880 to 1890. These are mainly useful in determining by differences the temperature that will occur in a cold wave when the temperature in the country over which it has already passed is known.

TABLE XXII.—NOVEMBER. LOWEST 7 A. M. TEMPERATURES.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Eastport	12	4	22	13	19	26	18	17	7	22	16
Northfield	....	....	....	....	....	....	....	14	3	18	......
Portland, Me	14	16	24	19	23	22	23	20	11	23	19
Boston	12	17	20	19	24	24	28	22	16	23	20
Nantucket	....	....	....	....	....	....	34	32	28	30	......
Block Island	....	....	....	....	....	....	....	....	24	26	......
Albany	13	20	22	24	21	15	14	22	10	22	18
New York City	17	25	27	22	21	27	29	25	20	28	24
Harrisburg	....	....	....	....	....	....	....	....	20	29	......
Philadelphia	11	25	28	25	24	30	28	26	20	32	25
Atlantic City	13	....	....	....	....	....	....	....	28	29	......
Baltimore	17	27	28	25	28	33	28	25	26	32	27
Washington	14	22	26	21	26	32	26	23	25	30	25
Lynchburgh	15	24	27	21	30	28	25	23	28	27	25
Norfolk	26	28	32	30	38	37	30	32	34	32	32
Charlotte	20	22	29	22	32	30	29	22	31	26	26
Raleigh	....	....	....	....	....	....	....	....	32	26	......
Hatteras	38	33	36	37	42	40	37	40	39	37	38
Wilmington	25	28	35	32	37	34	32	28	37	29	32
Charleston	32	30	36	33	41	35	37	29	38	33	34
Augusta	28	28	35	29	35	30	27	25	31	26	29
Savannah	33	30	37	33	38	36	36	27	38	30	34
Jacksonville	40	33	39	43	39	37	37	28	41	32	37
Titusville	....	....	....	....	....	....	....	....	45	40	......
Pt. Jupiter	....	....	....	....	....	....	....	....	43	50	......
Key West	67	64	60	68	69	58	65	63	62	62	64
Atlanta	25	21	29	21	21	30	28	18	30	24	25
Cedar Keys	45	....	....	....	....	....	....	....	43	36	......
Pensacola	35	28	30	36	40	35	35	30	36	34	34
Mobile	....	27	30	33	36	34	31	27	34	30	31
Montgomery	28	25	29	29	34	32	37	24	32	29	30
Vicksburg	24	27	32	30	35	32	28	28	36	30	29
New Orleans	37	34	40	39	44	41	35	35	42	38	38
Shreveport	20	27	29	32	32	34	29	27	36	31	30
Fort Smith	....	....	32	26	24	26	22	18	30	22	25
Little Rock	14	25	28	27	30	30	25	20	35	25	26
Palestine	....	....	28	35	33	36	28	22	35	28	31
Galveston	31	38	40	44	46	48	38	38	44	40	41
San Antonio	23	29	40	....	....	36	28	28	34	32	31
Corpus Christi	....	....	....	....	....	....	....	....	40	42	......
Brownsville	32	....	....	....	....	....	....	....	46	39	......
Rio Grande City	30	34	....	45	42	36	31	43	39	34	37
Abilene	....	....	....	....	....	23	15	16	29	26	......
Memphis	16	23	30	21	27	30	30	18	32	24	25
Nashville	17	21	30	17	28	30	24	12	27	26	23

TABLE XXII.—NOVEMBER. LOWEST 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Chattanooga	24	13	28	18	28	30	27	17	30	24	24
Knoxville	19	16	27	15	28	30	25	15	28	23	23
Louisville	9	20	30	19	23	36	23	11	32	20	22
Indianapolis	— 4	13	24	12	12	24	18	7	26	16	15
Cincinnati	6	22	26	19	19	28	21	8	29	20	20
Columbus	— 3	15	23	13	15	26	20	4	24	21	16
Parkersburgh	....	....	....	....	....	....	....	....	25	23	....
Pittsburgh	5	20	24	18	23	22	23	17	26	23	20
Oswego	17	15	24	21	20	20	22	23	12	24	20
Rochester	10	20	18	18	18	24	21	19	14	21	18
Buffalo	7	19	18	19	21	28	24	15	16	22	19
Erie	8	19	27	22	23	25	25	19	22	27	22
Cleveland	1	19	26	20	16	23	23	11	24	20	18
Sandusky	3	20	22	19	16	26	22	5	26	17	17
Toledo	6	20	25	16	17	29	21	12	25	15	19
Detroit	1	21	24	14	7	30	25	18	22	16	18
Port Huron	— 3	19	15	10	14	29	20	13	21	14	15
Alpena	1	14	19	4	11	24	15	8	14	17	13
Sault Ste. Marie	....	....	....	....	....	....	....	....	18	14	....
Marquette	— 2	13	23	6	— 2	26	11	— 2	12	17	10
Green Bay	....	10	20	0	— 4	23	8	— 7	—10	11	6
Manistee	....	....	....	....	....	....	....	....	18	17	....
Grand Haven	4	22	26	19	14	28	8	13	19	23	18
Milwaukee	— 2	7	22	7	1	23	14	— 3	10	12	9
Chicago	2	15	21	10	6	28	19	2	21	14	14
Duluth	— 9	5	12	4	—14	20	— 1	—13	6	4	1
St. Paul	—15	6	14	4	— 5	18	— 2	—15	7	— 2	1
La Crosse	— 7	8	19	6	— 4	21	7	—18	10	6	5
Dubuque	— 5	7	18	9	1	20	12	—12	17	10	8
Davenport	1	11	22	11	10	23	12	0	20	7	12
Des Moines	2	8	18	8	7	23	11	— 7	15	7	9
Keokuk	5	10	19	13	16	23	17	9	23	8	14
Springfield, Ill	6	16	21	14	18	30	25	7	24	10	17
Cairo	12	21	28	16	23	28	25	12	30	20	22
St. Louis	8	15	23	19	20	32	25	11	30	16	20
Springfield, Mo	....	....	....	....	....	....	....	....	27	—	....
Leavenworth	....	12	22	16	12	28	15	— 4	23	10	13
Wichita	....	....	....	....	....	....	....	....	26	15	....
Concordia	....	....	....	....	....	25	9	—11	17	10	....
Omaha	0	5	17	10	5	23	10	—10	18	7	9
Yankton	— 4	2	12	3	— 1	19	1	—15	14	2	3
Valentine	....	....	....	....	....	16	— 1	—30	10	— 1	....
Huron	....	— 2	7	0	— 8	8	— 4	—28	4	— 2	— 3
Fort Sully	....	....	....	....	....	....	....	....	2	15	....
Moorhead	....	—14	— 7	—14	—12	5	—21	—20	— 2	— 2	— 9
St. Vincent	—20	—13	— 3	—15	—16	10	—17	—28	0	— 4	—13
Bismarck	—12	—11	9	—14	— 7	11	— 4	— 2	2	— 6	— 3
Fort Buford	—16	—13	— 1	—18	— 9	13	— 5	—27	3	—24	—10
Fort Assinniboine	—22	— 7	3	—16	— 6	22	— 8	—24	— 3	—10	— 7
Helena	—14	3	6	—10	11	21	— 7	—10	— 2	14	1
Poplar River	....	....	....	—24	—25	—	—16	—30	— 2	....	—24
Fort Custer	—24	— 2	— 9	—17	— 9	13	— 6	—11	—10	10	— 6
Rapid City	....	....	....	....	....	....	....	....	12	2	....
Salt Lake City	6	14	10	20	27	23	18	17	30	28	19
Cheyenne	—16	15	—11	16	13	17	....	— 6	10	2	4

TABLE XXII.—NOVEMBER. LOWEST 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1888.	Means.
North Platte	— 4	0	6	13	5	24	— 4	—24	9	3	3
Denver	— 8	12	— 1	25	18	16	1	— 9	12	4	7
Las Animas	.....	11	1	10	10	21	.....	.....	.....	.....	....
Pike's Peak	—31	— 6	—22	— 6	— 2	— 8	—26	—11	—	—	—14
Montrose	.....	....	.....	.....	....	14	— 5	12	20	—	....
Pueblo	.....	.....	.....	.....	.....	.....	.....	.....	14	3	....
Dodge City	— 4	15	10	17	13	21	8	—10	21	18	11
Fort Elliott	— 5	14	15	25	21	28	12	— 4	23	22	15
Fort Sill	1	24	24	.....	26	26	19	10	26	21	20
Santa Fé	— 6	12?	10	.....	.....	24	7	17	15	16	12
Cheyenne	—16	15	—11	16	13	17	—	— 6	.....	.....	....
Escanaba	— 7	10	20	0	— 4	23	8	— 7	—	—	5
Lamar	.....	.....	....	.....	.....	23	18	6	30	.....	....
Las Animas	.....	11	1	10	10	21	.....	.....	.....	.....	....

TABLE XXIII.—DECEMBER. LOWEST 7 A. M. TEMPERATURES.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1888.	Means.
Eastport	2	2	5	—15	—16	9	— 9	— 8	— 2	2	— 3
Northfield	.....	.....	.....	.....	.....	.....	.....	—21	— 7	—10	....
Portland, Me	3	13	9	— 7	— 6	8	— 4	— 1	4	5	2
Boston	0	11	8	— 9	—10	13	9	6	6	13	5
Nantucket	.....	.....	.....	.....	.....	.....	19	16	12	29	....
Block Island	.....	.....	14	1	— 2	20	19	14	11	21	12
Albany	5	19	12	— 4	—13	10	2	0	— 2	8	4
New York City	— 5	23	12	5	3	16	14	14	10	13	10
Harrisburg	.....	.....	.....	.....	.....	.....	.....	....	12	22	....
Philadelphia	— 5	23	14	15	2	15	14	16	14	18	13
Atlantic City	— 4	23	12	13	3	15	15	16	14	24	13
Baltimore	— 1	25	12	23	10	15	15	16	17	26	16
Washington	—10	22	9	20	6	15	15	16	17	26	13
Lynchburgh	— 2	24	10	26	7	19	15	14	19	22	15
Norfolk	19	28	17	27	13	26	20	19	23	33	23
Charlotte	— 1	28	13	23	12	22	20	19	21	30	19
Raleigh	.....	.....	.....	.....	.....	.....	.....	15	22	26	....
Hatteras	14	32	21	32	21	29	30	24	29	42	27
Wilmington	11	32	20	28	20	29	24	20	26	33	24
Charleston	15	35	25	30	27	30	26	30	31	39	29
Augusta	8	33	22	29	25	24	21	25	24	28	24
Savannah	16	34	28	30	30	30	26	28	28	34	28
Jacksonville	23	42	28	30	34	32	29	32	29	41	32
Titusville	.....	.....	.....	.....	.....	.....	.....	43	36	50	....
Pt. Jupiter	.....	.....	.....	.....	.....	.....	.....	.....	40	59	....
Key West	59	62	53	58	63	51	58	64	54	67	59
Atlanta	2	29	14	22	13	22	15	16	22	30	19
Cedar Keys	22	43	30	33	33	33	31	35	33	43	34
Pensacola	18	39	26	30	23	29	27	30	29	39	29
Mobile	14	37	25	29	22	27	24	27	27	32	26
Montgomery	8	34	19	27	17	26	22	24	25	29	23
Vicksburg	16	35	20	30	21	23	21	22	26	36	25
New Orleans	22	42	32	39	30	31	29	31	31	40	33
Shreveport	12	34	22	30	21	26	22	22	29	36	25
Fort Smith	.....	.....	13	22	14	14	10	9	23	27	17

TABLE XXIII.—DECEMBER. LOWEST 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Little Rock	6	34	18	29	15	20	15	16	24	28	20
Palestine	....	34?	24	31	17	25	15	11	31	34	25
Galveston	21	43	38	41	34	36	27	33	41	48	36
San Antonio	13	33	30	....	....	28	19	24	36	36	27
Corpus Christi	....	....	....	....	....	....	....	....	40	47	......
Brownsville	23	43	36	38	30	34	31	28	42	52	36
Rio Grande City	25	32	....	37	34	32	28	27	35	50	33
Abilene	....	....	....	....	....	15	10	13	32	25	......
Memphis	4	32	12	23	10	19	17	15	24	28	18
Nashville	4	30	6	21	2	19	14	9	18	26	15
Chattanooga	3	30	12	24	9	21	13	14	22	28	18
Knoxville	— 2	24	7	19	5	20	9	14	22	25	14
Louisville	— 4	22	6	16	1	10	7	6	20	26	11
Indianapolis	—12	16	— 7	11	— 9	— 1	— 2	— 3	18	25	4
Cincinnati	— 4	26	1	20	0	4	3	2	19	23	9
Columbus	— 8	19	— 3	14	— 5	2	3	4	14	21	6
Parkersburgh	....	....	....	....	....	....	....	....	13	19	......
Pittsburgh	— 8	19	1	18	0	7	10	12	14	24	10
Oswego	4	18	14	— 2	—15	9	— 2	2	— 3	7	3
Rochester	— 6	22	7	— 2	— 8	6	— 2	5	8	17	5
Buffalo	— 8	22	8	9	— 1	5	0	10	5	14	6
Erie	— 9	21	4	12	7	7	2	9	8	12	7
Cleveland	— 9	20	— 7	14	— 4	7	6	12	14	22	8
Sandusky	— 6	22	— 5	16	— 8	3	5	6	16	22	7
Toledo	— 8	22	— 2	13	— 7	0	0	4	13	21	6
Detroit	—10	24	3	12	— 5	2	4	8	13	20	7
Port Huron	— 8	14	4	3	— 6	— 2	0	8	9	13	4
Alpena	—15	14	5	3	— 9	— 3	2	9	8	12	3
Sault Ste. Marie	....	....	....	....	....	....	....	....	— 1	3	......
Marquette	—16	13	0	— 8	— 9	— 5	—11	4	14	8	— 1
Escanaba	—20	10	—10	— 8	—13	— 8	—14	3	....	....	— 8
Green Bay	....	....	....	....	....	....	—21	—15	7	7	......
Manistee	....	....	....	....	....	....	....	....	18	19	......
Grand Haven	1	22	0	12	—11	8	1	12	17	19	8
Milwaukee	—19	9	—10	— 6	—17	—11	—16	— 4	13	14	— 5
Chicago	—13	13	— 7	1	— 7	— 3	— 8	— 3	15	16	0
Duluth	—30	— 4	—20	—21	—29	—19	—19	—16	2	— 6	—16
St. Paul	—25	4	—12	—10	—27	—17	—20	—17	6	— 4	—12
La Crosse	—20	6	—18	—10	—24	— 9	—15	—17	....	7	—11
Dubuque	—18	8	—12	— 3	—11	— 8	—23	—15	9	11	— 6
Davenport	—14	15	— 8	5	— 6	— 6	—21	—12	14	12	— 2
Des Moines	—12	14	—13	— 8	—12	2	—17	—12	11	9	— 4
Keokuk	—15	14	—10	4	— 8	— 5	—14	—10	16	11	— 2
Springfield, Ill	—13	19	— 4	5	— 2	12	— 3	— 7	16	16	4
Cairo	— 1	26	9	15	— 2	16	11	6	20	27	13
St. Louis	—13	16	— 4	9	— 6	10	2	— 2	22	22	6
Springfield, Mo	....	....	— 3	....	....	....	....	....	19	—	......
Leavenworth	—13	22	— 5	4	— 5	4	— 8	— 9	12	12	1
Kansas City	....	....	....	....	....	....	....	....	14	14	......
Lamar	....	....	....	....	....	0	0	— 5	20	—	......
Wichita	....	....	....	....	....	....	....	....	17	10	......
Concordia	....	....	....	....	....	1	— 5	— 9	12	6	......
Omaha	—13	15	— 9	4	—14	— 4	—10	—14	10	11	— 2
Yankton	—14	10	—15	—11	—22	— 6	—19	—15	8	3	— 8
Valentine	....	....	....	....	....	— 8	—12	—25	— 1	8	......

TABLE XXIII.—DECEMBER. LOWEST 7 A. M. TEMPERATURES.—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Fort Buford	—36	—14	—20	—28	—40	— 4	—32	—22	— 7	— 7	—21
Huron	....	4	—13	—15	—31	—11	—32	—20	— 5	— 7	—15
Fort Sully	....	....	....	....	—19	— 7	—19	—17	— 4	— 5	......
Moorhead	....	— 8	—27	—34	—28	—16	—35	—35	— 5	— 6	—22
St. Vincent	—37	—14	—25	—35	—45	—13	—37	—40	—10	—21	—28
Bismarck	—27	— 8	—20	—22	—30	—10	—32	—23	— 4	— 1	—18
Fort Assinniboine	—40	3	—11	—15	—36	0	—19	—29	— 2	— 9	—16
Helena	—37	5	—19	— 3	—25	7	— 7	—12	—12	3	—10
Poplar River	....	....	—	—38	—46	— 9	—35	—29	— 9	—	......
Fort Custer	—40	6	0	— 6	—43	8	—12	—17	— 8	— 2	—11
Rapid City	....	....	....	....	....	....	....	....	7	11	......
Salt Lake City	20	18	14	11	8	13	24	10	15	15	15
Cheyenne	—13	20	6	— 2	—10	2	....	— 5	9	7	2
North Platte	—23	10	— 4	— 2	—15	— 6	— 6	—17	— 2	11	— 5
Denver	— 4	21	0	4	— 4	— 1	14	—14	9	12	4
Montrose	....	....	....	....	....	—10	18	—13	14	—	......
Las Animas	....	12	— 2	4	—22	— 3	3	—10	....	....	......
Pueblo	....	....	....	....	....	....	....	....	11	8	......
Pike's Peak	—10	— 6	—11	—12	—15	—18	— 4	—32	....	—	—14
Dodge City	—10	18	2	12	—10	5	— 2	— 8	14	13	3
Fort Elliott	— 3	20	5	15	0	10	3	— 3	22	14	8
Fort Sill	3	28	12	....	2	16	4	8	22	23	13
Santa Fé	0	—	6	....	1	11	15	— 4	16	15	7

TABLE XXIV.—JANUARY. LOWEST 7 A. M. TEMPERATURES.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Eastport	5	1	—13	—10	— 6	— 8	—11	—10	— 9	0	— 6
Northfield	....	....	....	....	....	....	....	....	—24	— 8	......
Portland, Me	15	4	— 9	4	2	— 2	—10	—12	—10	8	— 1
Boston	11	0	—11	5	0	0	— 9	— 5	— 6	10	— 1
Nantucket	....	....	....	....	....	....	....	5	— 2	20	......
Block Island	....	....	....	7	10	8	2	6	1	18	......
Albany	6	— 5	— 9	0	— 3	— 9	— 9	—15	—10	7	— 5
New York City	19	5	— 1	4	9	5	3	7	3	18	7
Harrisburg	....	....	....	....	....	....	....	....	....	17	......
Philadelphia	19	9	0	10	11	6	6	8	4	21	9
Atlantic City	20	3	3	8	6	12	4	8	3	24	9
Baltimore	20	— 2	10	15	11	11	4	7	9	23	11
Washington	16	—10	10	10	5	10	0	7	9	24	8
Lynchburgh	28	2	19	14	6	14	— 1	7	15	22	13
Norfolk	35	20	22	21	11	21	10	13	18	25	20
Charlotte	28	16	20	17	8	11	1	9	18	23	15
Raleigh	....	....	....	....	....	....	....	9	17	24	......
Hatteras	44	30	30	25	16	28	15	21	24	33	27
Wilmington	40	29	25	24	10	24	14	15	21	29	23
Charleston	35	31	28	27	15	29	14	17	27	32	26
Augusta	33	28	28	23	15	23	7	15	23	25	22
Savannah	35	33	28	29	20	30	13	17	28	31	26
Jacksonville	48	35	33	29	21	32	16	23	28	33	30
Titusville	....	....	....	....	....	....	....	....	38	38	......
Pt. Jupiter	....	....	....	....	....	....	....	....	46	43	......

TABLE XXIV.—JANUARY. LOWEST 7 A. M. TEMPERATURES—Continued

Stations.	1880.	1881.	1882.	1883.	1684.	1885.	1886.	1887.	1888.	1889.	Means.
Key West	66	62	58	56	53	62	42	51	61	60	57
Atlanta	31	22	24	18	1	15	0	9	16	20	16
Cedar Keys	50	36	35	32	27	33	18	25	29	36	32
Pensacola	43	30	34	30	17	25	16	21	26	37	28
Mobile	41	28	32	21	15	22	13	17	23	34	25
Montgomery	37	26	25	26	8	21	8	13	21	28	21
Vicksburg	37	28	32	22	12	21	6	10	18	29	32
New Orleans	44	34	49	37	25	28	16	23	30	36	32
Shreveport	36	26	31	14	11	14	4	14	19	28	20
Fort Smith	....	....	....	5	-2	2	-6	-4	2	14	......
Little Rock	32	19	25	12	8	11	-4	8	9	20	14
Palestine	....	....	35?	10	9	12	2	12	4	26	......
Galveston	50	29	40	21	28	26	13	25	25	33	29
San Antonio	40	21	30	20	....	....	11	18	13	28	23
Corpus Christi	....	....	....	....	....	....	....	....	17	36	......
Brownsville	51	21	37	27	27	27	26	30	23	38	31
Rio Grande City	40	20	36	....	23	26	21	28	23	32	28
Abilene	....	....	....	....	....	....	0	8	-2	25	......
Memphis	35	16	21	11	0	7	-8	6	7	24	12
Nashville	30	15	19	12	-9	-2	-8	1	12	22	9
Chattanooga	30	13	23	15	1	13	-5	8	14	22	13
Knoxville	27	12	21	4	-10	8	-6	7	12	21	10
Louisville	31	8	17	8	-15	0	-3	-3	10	20	7
Indianapolis	23	-2	8	-7	-22	-10	-14	-11	-5	11	-3
Cincinnati	27	2	19	6	-8	-8	-11	-4	8	22	5
Columbus	19	-1	14	4	-19	-8	-10	-5	3	18	2
Parkersburgh	....	....	....	....	....	....	....	....	....	18	......
Pittsburgh	22	4	4	7	-2	4	-2	8	5	19	7
Oswego	20	4	-11	2	3	-3	-17	-8	-8	4	-1
Rochester	21	1	-4	-4	2	-3	-1	2	-1	6	2
Buffalo	21	1	-2	0	-11	-4	1	2	-4	10	1
Erie	24	4	0	-1	-6	-2	-2	-2	-4	15	3
Cleveland	18	-1	4	-1	-10	-7	-8	-4	3	14	1
Sandusky	27	4	10	-5	-7	-6	-6	-6	-1	14	2
Toledo	25	3	10	-8	-10	-8	-8	-10	-4	12	0
Detroit	20	-1	13	-6	-4	-5	0	-2	-3	8	2
Port Huron	18	-7	5	-11	-9	-11	-4	-9	-6	10	2
Alpena	10	-15	-15	-15	-13	-18	-11	-15	-13	6	-10
Sault Ste. Marie	....	....	....	....	....	....	....	....	....	-12	......
Marquette	1	-21	-6	-14	-15	-23.	-17	-18	-18	4	-13
Escanaba	1	-24	-10	-20	-16	-25	-22	-22	-28	—	-18
Green Bay	....	....	....	....	....	....	....	-29	-36	0	......
Manistee	....	....	....	....	....	....	....	....	....	6	......
Grand Haven	17	0	4	-2	-6	0	2	0	-4	11	2
Milwaukee	13	-17	-5	-20	-24	-22	-22	-15	-21	3	-13
Chicago	20	-10	1	-17	-18	-12	-12	-14	-14	2	-7
Duluth	-14	-23	-21	-33	-25	-30	-31	-28	-30	-13	-25
St. Paul	-5	-24	-8	-29	-23	-25	-31	-31	-37	-10	-23
La Crosse	5	-28	-9	-30	-25	-24	-20	-27	-37	-4	-20
Dubuque	10	-24	-3	-25	-24	-19	-22	-30	-30	-4	-17
Davenport	20	-20	4	-17	-17	-17	-21	-20	-23	1	-11
Des Moines	10	-15	1	-15	-24	-16	-23	-18	-26	0	-13
Keokuk	22	-11	4	-13	-23	-14	-18	-16	-21	4	-9
Springfield, Ill	28	-8	12	-6	-22	-14	-11	-16	-15	4	-5
Cairo	31	3	16	8	-13	-4	-8	-1	1	20	5

TABLE XXIV.—JANUARY. LOWEST 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
St. Louis	29	— 8	7	— 2	—19	— 7	— 7	— 8	— 8	14	— 1
Springfield, Mo	....	....	17	— 1	....	....	....	....	—10	6	......
Leavenworth	23	— 7	5	—10	—20	—10	—20	—15	—20	5	— 7
Kansas City	....	....	....	....	....	....	....	....	....	5	......
Lamar	....	....	....	....	....	....	—16	—17	—12	—	......
Wichita	....	....	....	....	....	....	....	....	—	10	......
Concordia	....	....	....	....	....	....	—19	—17	—25	4	......
Omaha	12	—16	3	—16	—24	—18	—23	—20	—23	— 2	—13
Yankton	1	—31	— 2	—18	—25	—22	—27	—28	—26	— 9	—19
Valentine	....	....	....	....	....	....	—29	—26	—26	—10	......
Fort Buford	—17	—41	—23	—38	—41	—44	—41	—41	—47	—13	—35
Huron	....	....	—10	—24	—27	—30	—32	—38	—30	—23	—26
Fort Sully	....	....	....	....	....	....	—28	—28	—28	—17	—
Moorhead	....	—30	—28	—40	—43	—30	—36	—41	—40	—26	—35
St. Vincent	....	—39	—38	—40	—36	—43	—40	—40	—50	—36	—40
Bismarck	—16	—33	—19	—34	—39	—30	—35	—39	—32	—18	—30
Fort Assinniboine	....	—23	—23	—37	—26	—27	—39	—24	—23	—19	—27
Helena	....	—20	— 6	—34	— 3?	—12	—30	—17	—37	—11	—21
Poplar River	....	....	....	....	—45	—63	—48	—34	—57	—15	......
Fort Custer	—14	—27	—20	....	—15	—29	—38	—30	—41	— 9	—22
Rapid City	....	....	....	....	....	....	....	....	—27	2	......
Salt Lake City	7	10	3	—15	4	6	4	17	—14	6	3
Cheyenne	—11	—10	— 4	—24	— 3	— 8	—23	....	—24	6	—11
North Platte	0	—24	— 4	—22	— 5	—25	—20	—21	—34	— 7	16
Denver	— 3	— 8	4	—16	— 2	— 6	—14	—13	—17	6	—7
Montrose	....	....	....	....	....	....	—10	6	—17	—	......
Las Animas	....	....	4?	—21	— 6	—24	—18	—16	—16	....	......
Pueblo	....	....	....	....	....	....	....	....	....	—10	......
Pike's Peak	—13	—30	—15	—34	—28	—28	—19	—19	—20	—	—23
Dodge City	10	—10	2	—16	— 6	—16	—15	—16	—18	11	— 7
Fort Elliott	14	— 7	4	—12	— 1	— 4	— 9	— 2	—10	18	— 1
Fort Sill	27	0	11	— 2	....	2	— 4	3	— 6	18	5
Santa Fé	4	— 4	10	— 6	....	— 1	— 5	7	1	6	1

TABLE XXV.—FEBRUARY. LOWEST 7 A. M. TEMPERATURES.

Eastport	—10	— 4	— 4	— 4	6	— 8	—14	— 3	— 8	— 9	— 6
Northfield	....	....	....	....	....	....	....	....	—18	—31	......
Portland, Me	0	1	6	11	12	— 3	— 8	— 2	— 5	— 4	1
Boston	— 1	— 3	5	13	4	2	— 5	7	— 2	2	2
Nantucket	....	....	....	....	....	....	....	17	2	6	......
Block Island	....	....	....	17	12	8	1	12	1	3	......
Albany	— 7	— 3	12	11	11	—10	—10	4	— 7	— 2	0
New York City	11	2	19	15	5	0	— 1	17	4	3	8
Harrisburg	....	....	....	....	....	....	....	....	—	0	......
Philadelphia	12	0	24	21	11	0	0	18	4	4	9
Atlantic City	13	— 1	22	19	13	5	0	18	4	5	10
Baltimore	18	6	25	23	12	5	— 1	21	11	3	12
Washington	15	3	21	22	10	2	— 2	20	13	4	11
Lynchburgh	21	19	27	28	14	5	2	21	12	8	16
Norfolk	28	13	30	32	24	16	4	28	18	18	21

TABLE XXV.—FEBRUARY. LOWEST 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Charlotte	30	22	27	32	21	13	7	27	16	14	21
Raleigh	....	....	....	....	....	....	....	23	15	13	......
Hatteras	38	23	33	37	28	22	14	34	28	23	28
Wilmington	31	21	31	36	29	21	12	31	25	22	26
Charleston	38	28	34	40	29	24	16	35	29	27	30
Augusta	32	27	33	36	24	15	15	32	22	21	26
Savannah	40	30	34	40	27	26	20	35	27	26	30
Jacksonville	43	35	39	41	37	34	25	39	35	40	37
Titusville	....	....	....	....	....	....	....	....	38	41	......
Pt. Jupiter	....	....	....	....	....	....	....	....	48	46	......
Key West	66	60	67	66	62	56	52	60	64	59	61
Atlanta	32	21	32	28	13	9	9	29	14	14	20
Cedar Keys	45	35	41	44	38	34	27	40	36	35	38
Pensacola	36	32	37	38	29	24	21	39	32	30	32
Mobile	35	30	37	37	29	30	21	38	32	29	32
Montgomery	34	27	34	32	22	17	16	35	26	22	26
Vicksburg	32	28	34	29	26	19	17	38	28	26	28
New Orleans	44	37	42	43	35	30	26	45	37	32	37
Shreveport	30	24	35	26	21	17	22	35	34	28	27
Fort Smith	....	....	....	10	11	1	3	20	16	16	......
Little Rock	33	22	30	23	18	15	8	24	22	18	21
Palestine	....	....	38	17	19	15	24	25	35	26	25
Galveston	41	34	46	31	31	30	34	48	42	43	38
San Antonio	38	....	37	22	....	....	28	28	39	34	32
Corpus Christi	....	....	....	....	....	....	....	....	44	44	......
Brownsville	41	38	49	30	33	36	42	41	47	46	39
Rio Grande City	38	35	40	....	33	33	37	42	45	43	38
Abilene	....	....	....	....	....	....	10	13	23	19	......
Memphis	26	23	29	21	19	11	6	26	22	20	20
Nashville	14	20	26	22	10	— 1	— 6	24	12	13	13
Chattanooga	28	21	30	30	12	7	8	27	11	16	19
Knoxville	23	20	25	24	9	2	1	22	10	12	15
Louisville	22	8	25	17	14	4	2	21	10	8	13
Indianapolis	18	8	19	8	1	— 8	— 2	12	— 2	— 1	5
Cincinnati	20	11	26	16	7	— 9	— 1	15	10	8	10
Columbus	14	0	22	12	2	—11	— 5	13	6	2	6
Parkersburgh	....	....	....	....	....	....	....	....	—	6	......
Pittsburgh	12	— 2	22	16	1	— 6	— 2	17	8	1	7
Oswego	10	— 2	8	9	8	— 8	— 8	3	—10	— 5	0
Rochester	9	1	12	6	— 5	—10	— 4	8	— 5	— 7	00
Buffalo	10	— 7	14	7	— 6	—12	—10	8	— 5	— 8	— 1
Erie	17	— 8	22	9	— 5	—10	— 8	11	— 4	—10	1
Cleveland	13	— 2	21	7	0	—15	— 7	11	0	— 4	2
Sandusky	18	3	21	7	1	—11	— 2	12	— 1	— 3	4
Toledo	18	— 1	22	7	3	—15	— 4	4	— 3	— 4	3
Detroit	13	— 5	21	8	— 4	—10	0	2	— 6	— 6	1
Port Huron	8	— 6	14	— 2	—14	—24	—12	3	—12	—11	— 6
Alpena	0	—25	8	— 9	—15	—22	—17	—13	—18	—11	—12
Sault Ste. Marie	....	....	....	....	....	....	....	....	—	—17	......
Marquette	— 3	—14	10	—10	—16	....	—12	—13	—25	—20	—11
Escanaba	— 9	—17	3	— 8	—28	—21	—19	—13	—27	—	—15
Green Bay	....	....	....	....	....	....	....	—17	—27	—22	......
Manistee	....	....	....	....	....	....	....	....	—	— 9	......
Grand Haven	11	— 9	21	2	— 1	— 6	—12	— 4	— 7	— 6	— 1
Milwaukee	4	4	13	—11	—11	—23	—14	— 9	—19	—16	— 8

TABLE XXV.—FEBRUARY. LOWEST 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Chicago	13	9	10	— 8	— 2	—10	— 4	— 6	—15	—10	— 2
Duluth	—18	—11	4	—26	—16	—30	—24	—23	—32	—30	—21
St. Paul	—15	— 8	— 2	—23	—18	—23	—26	—23	—32	—25	—20
La Crosse	1	—13	3	—18	— 9	—20	—26	—17	—26	—23	—15
Dubuque	3	— 9	6	—12	— 6	—18	—21	—12	—20	—15	—10
Davenport	8	— 7	13	—10	3	—17	—17	—10	—20	— 9	— 7
Des Moines	4	— 5	4	—19	— 5	—18	—17	—13	—20	—11	—10
Keokuk	11	0	12	— 7	3	—14	—17	— 6	—10	— 7	— 4
Springfield, Ill	15	6	18	— 1	9	—10	— 8	4	— 8	— 4	— 2
Cairo	26	18	28	13	14	2	— 1	20	14	8	14
St. Louis	15	5	20	0	7	— 5	— 7	5	0	0	4
Springfield, Mo	.....	.....	15	2	.....	.....	.....	.....	6	1	......
Leavenworth	7	— 3	12	—10	0	—15	— 8	— 5	— 4	— 3	— 3
Kansas City	.....	.....	.....	.....	.....	.....	.....	.....	—	— 4	......
Lamar	.....	.....	.....	.....	.....	.....	— 8	— 2	7	—	......
Wichita	.....	.....	.....	.....	.....	.....	.....	.....	—	— 2	......
Concordia	.....	.....	.....	.....	.....	.....	— 6	—11	— 4	— 6	......
Omaha	0	—12	5	—18	— 7	—17	—19	—15	—17	— 9	—11
Yankton	— 8	—20	— 5	—20	—20	—18	—23	—17	—19	—18	—17
Valentine	.....	.....	.....	.....	.....	.....	—19	—20	— 5	—13	......
Fort Buford	—22	—20	—24	—33	—37	—30	—25	—37	—26	—30	—28
Huron	.....	.....	—11	—25	—25	—24	—24	—24	—30	—28	—24
Fort Sully	.....	.....	.....	.....	.....	.....	—18	—23	—13	—17	......
Moorhead	.....	—28	—15	—33	—30	—28	—35	—33	—44	—35	—31
St. Vincent	.....	—25	—34	—38	—30	—38	—34	—36	—49	—41	—36
Bismarck	—14	—23	—23	—27	—28	—26	—22	—37	—30	—34	—26
Fort Assinniboine	.....	—24	—22	—38	—31	—16	— 7	—48	—18	—18	—25
Helena	.....	—18	—20	—27	—19	— 4	—11	—36	— 0	—13	—10
Poplar River	.....	.....	.....	.....	—47	—50	—33	—45	—26	—34	......
Fort Custer	—17	—29	—14	.....	—28	—18	— 3	—30	0	—21	—18
Rapid City	.....	.....	.....	.....	.....	.....	.....	.....	2	—15	......
Salt Lake City	6	17	8	3	— 8	23	20	16	26	12	12
Cheyenne	— 1	—12	8	—24	—25	— 8	11	.....	9	—14	— 6
North Platte	— 6	—20	— 2	—26	—13	—21	5	—15	2	— 5	—10
Denver	— 5	—18	12	—16	—10	5	8	— 2	20	0	4
Montrose	.....	.....	.....	.....	.....	7?	12	6	18	—	......
Las Animas	.....	.....	6	.....	—21	— 2	13	— 4	16	.....	......
Pueblo	.....	.....	.....	.....	.....	.....	.....	.....	—	— 5	......
Pike's Peak	—27	—18	— 6	—20	—30	—23	—12	—16	—11	—	—18
Dodge City	— 4	— 6	10	—16	— 4	— 3	— 1	— 8	8	— 7	— 3
Fort Elliott	7	— 1	13	—10	2	3	7	5	13	3	4
Fort Sill	18	10	24	— 4	.....	7	7	9	19	9	11
Santa Fé	1	10	12	9	.....	6	9	10	17	5	9

TABLE XXVI.—MARCH. LOWEST 7 A. M. TEMPERATURES.

Eastport	1	23	12	— 1	3	— 3	— 2	0	6	19	6
Northfield	.....	.....	.....	.....	.....	.....	.....	—15	— 6	11	......
Portland, Me	11	26	19	6	8	3	— 2	3	11	20	11
Boston	.....	25	17	13	6	6	2	12	13	26	13
Nantucket	.....	.....	.....	.....	.....	.....	.....	8	17	30	......

TABLE XXV.—MARCH. LOWEST 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Block Island	....	....	....	11	11	10	8	19	15	26	......
Albany	9	19	24	8	13	−5	−3	6	2	22	10
New York City	18	23	22	10	6	6	10	17	6	28	15
Harrisburg	....	....	....	....	....	....	....	....	—	25	......
Philadelphia	21	24	26	14	12	10	13	22	9	26	18
Atlantic City	21	23	24	14	11	10	15	21	11	29	18
Baltimore	24	28	28	18	19	13	15	23	14	30	21
Washington	23	26	26	15	15	11	16	23	12	30	20
Lynchburgh	32	28	32	23	18	18	24	27	18	32	25
Norfolk	29	31	34	27	26	21	23	28	19	33	27
Charlotte	35	30	32	28	24	26	27	28	25	32	29
Raleigh	....	....	....	....	....	....	....	28	21	33	......
Hatteras	36	34	40	33	25	27	30	33	27	36	32
Wilmington	37	34	38	34	31	30	30	31	26	36	33
Charleston	42	35	41	40	35	34	33	34	31	38	36
Augusta	39	33	39	35	29	28	27	30	29	33	32
Savannah	46	38	43	41	36	35	34	34	32	38	38
Jacksonville	47	40	48	41	43	38	38	37	36	41	41
Titusville	....	....	....	....	....	....	....	....	44	44	......
Pt. Jupiter	....	....	....	....	....	....	....	....	47	53	......
Key West	64	61	70	62	60	61	54	60	60	62	61
Atlanta	35	29	35	28	26	22	29	26	26	31	29
Cedar Keys	50	40	48	46	44	40	36	42	39	43	43
Pensacola	42	38	47	41	38	33	49	41	40	39	40
Mobile	40	39	47	40	37	31	36	37	36	40	38
Montgomery	39	34	40	36	33	28	31	33	32	36	34
Vicksburg	36	36	44	36	37	30	29	37	32	40	36
New Orleans	51	43	53	46	42	37	41	45	41	44	44
Shreveport	34	36	41	37	34	32	30	35	33	40	35
Fort Smith	....	....	....	30	25	25	29	30	23	27	......
Little Rock	32	32	42	34	30	29	24	32	28	32	32
Palestine	....	....	50	35	32	32	29	34	31	40	35
Galveston	....	48	45	43	41	48	42	47	43	46	45
San Antonio	29	40	33	40	....	36	36	41	38	40	37
Corpus Christi	....	....	....	....	....	....	....	48	44	47	......
Brownsville	37	48	52	46	38	51	43	47	46	48	46
Rio Grande City	33	40	50	....	32	50	46	46	44	45	43
Abilene	....	....	....	....	....	....	24	37	25	34	......
Memphis	30	32	39	29	28	27	27	30	28	34	30
Nashville	30	27	35	26	20	17	22	25	24	28	25
Chattanooga	33	28	36	28	25	20	26	26	23	29	27
Knoxville	33	23	30	24	17	18	24	23	20	27	24
Louisville	29	23	31	21	16	15	23	20	16	26	22
Indianapolis	27	21	26	15	7	4	16	18	9	26	17
Cincinnati	29	25	32	19	14	6	18	19	13	28	20
Columbus	24	17	28	16	7	2	13	15	12	23	16
Parkersburgh	....	....	....	....	....	....	....	....	—	26	......
Pittsburgh	19	20	25	13	11	6	12	15	10	27	16
Oswego	14	12	17	8	8	−8	−3	6	−1	21	7
Rochester	12	14	19	6	0	−4	1	10	1	20	8
Buffalo	12	15	19	4	1	−3	1	13	2	16	8
Erie	19	14	23	5	0	2	1	14	5	22	10
Cleveland	17	16	24	8	6	−2	8	13	9	24	12
Sandusky	23	15	25	12	9	−1	8	12	7	23	13
Toledo	17	20	27	10	4	−2	9	10	5	21	12

TABLE XXV.—MARCH. LOWEST 7 A. M. TEMPERATURES—Continued.

Stations.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Means.
Detroit	12	15	26	4	4	-2	7	8	4	20	10
Port Huron	13	10	16	1	-4	-10	2	5	-2	20	5
Alpena	0	-5	6	-4	-18	-16	-5	-2	-9	18	-4
Sault Ste. Marie	....	....	....	....	....	....	....	....	—	10	......
Marquette	-2	2	7	-6	-10	-15	-1	-6	12	10	-1
Escanaba	-14	0	8	-13	-26	-22	-7	-8	-16	....	-11
Green Bay	....	....	....	....	....	....	....	-1	-7	18	......
Manistee	....	....	....	....	....	....	....	....	—	19	......
Grand Haven	12	18	20	3	7	-5	6	....	2	20	9
Milwaukee	11	4	17	4	-5	-4	9	5	-2	24	6
Chicago	19	13	22	13	0	5	16	11	3	22	12
Duluth	-8	7	-4	10	-10	-14	-4	-11	-11	1	-4
St. Paul	-4	10	3	8	-12	-3	-2	-6	-13	18	0
La Crosse	2	8	12	-2	-10	-2	0	2	-9	22	2
Dubuque	3	6	18	6	-2	0	1	2	-4	24	5
Davenport	15	8	16	8	0	10	9	11	0	24	10
Des Moines	-3	8	15	7	-2	8	9	15	-4	17	7
Keokuk	14	18	20	12	4	9	12	20	5	22	14
Springfield, Ill	22	20	24	17	8	13	20	21	7	25	18
Cairo	30	29	35	28	20	19	23	24	21	30	27
St. Louis	23	21	25	19	10	15	24	24	14	26	20
Springfield, Mo	....	....	24	18	....	....	....	....	13	20	......
Leavenworth	4	14	16	15	12	16	9	22	11	23	14
Kansas City	....	....	....	....	....	....	....	....	—	24	......
Lamar	....	....	....	....	....	18	20	25	14	—	......
Wichita	....	....	....	....	....	....	....	....	—	18	......
Concordia	....	....	....	....	....	....	8	19	4	18	......
Omaha	-6	6	7	8	1	10	1	10	-3	17	5
Yankton	-12	2	3	4	-9	5	-4	1	-16	14	-4
Valentine	....	....	....	....	....	....	-8	-1	-10	11	......
Fort Buford	-23	5	-17	-7	-21	3	-5	-5	-23	-2	-10
Huron	....	....	-2	-3	-11	-3	-6	-4	-13	0	-5
Fort Sully	....	....	....	....	....	....	-10	-5	-10	14	......
Moorhead	....	-2	-19	-22	-23	-16	-6	-18	-19	-1	......
St. Vincent	....	-10	-25	-29	-24	-25	-11	-25	-28	-8	-21
Bismarck	-16	-6	-20	-9	-12	-9	-18	-15	-18	5	-13
Fort Assinniboine	....	16	-9	7	-23	17	-10	0	-22	6	-2
Helena	....	15	0	6	-7	20	-9	7	-13	5	3
Poplar River	....	....	....	—	3?	2	-9	-11	-32	-7	......
Fort Custer	-22	14	2	....	-10	13	-2	-1	-23	13	-2
Rapid City	....	....	....	....	....	....	....	....	-10	11	......
Salt Lake City	9	27	13	32	26	25	23	29	21	37	27
Cheyenne	-14	5	6	19	8	6	-12	16?	-4	16	5
North Platte	-18	5	10	18	2	11	-6	10	-12	12	3
Denver	-8	10	13	22	12	7	-8	15	1	19	8
Montrose	....	....	....	....	....	17	9	20	10	—	......
Las Animas	....	....	6	14	10	17	4	19	8	....	......
Pueblo	....	....	....	....	....	....	....	....	—	18	......
Pike's Peak	-11	-13	-20	-2	-20	-6	-15	-4	-9	—	-11
Dodge City	-8	18	14	18	10	15	13	17	0	22	12
Fort Elliott	-2	26?	18	17	17	19	14	25	10	23	17
Fort Sill	11	26	24	20	....	26	24	26	20	31	23
Santa Fé	2	15	9	25	....	24	11	22	16	20	14

SUMMARY.

The process of forecasting a cold wave by the foregoing method may be briefly summed up as follows:

A cold wave is either preceded by an extensive area of low barometric pressure or there is a high area of pressure to the northwest of where great falls of temperature may be expected to occur.

The extent of a cold wave, measured in terms of 100,000 square miles multiplied by a fall of 10° as the unit, is connected with the extent of low and high pressure and density of isothermal lines by the following formula:

$2.75\,H + 3.15\,L + 0.547\,L\,F =$ extent of cold wave. H is the extent of high pressure in units of 1 inch excess of pressure over an area of 100,000 square miles. L, is the deficiency of pressure in a low area, in terms of the same unit as for the high pressure. F, is one-tenth of the isothermal number, computed according to the rule described.

The accurate measurement by planimeter of the various areas between isobars of low and high-pressure areas may, in most cases, be dispensed with. This is especially the case where the areas are regular. The extent of high and low can be obtained with sufficient accuracy for practical purposes by multiplying the areas by one-third of the depth of the low or height of the high in inches. The area can be obtained from the greatest and least diameters of the bounding isobars of the high and low, considering the figures as approximately ellipses.

The areas between the isotherms will have to be measured by means of the planimeter except in the case of very regular areas nearly rectangular. In most cases, too, the areas of the high pressures will have to be measured.

The maximum fall of temperature is derived from the temperature computed by the method described, the mean of all the temperatures to the northwest of the selected place of greatest fall being taken with weights proportional to the extent of the various temperatures divided by their distances from the point of greatest fall.

From the extent of cold wave and the maximum fall the area of the 20° temperature-fall curve is derived by means of Tables XII and XIII.

The ratio of the axes of the 20° temperature-fall area or either one of the axes being determined and the area being known, the lengths of the axes are to be derived from Table XVI.

The lengths of axes being determined, a card-board pattern previously prepared of the exact shape and area adapted to the scale of the map is to be laid on the map and a line drawn around it.

The point of maximum fall being known, the curves of 30° and 40° temperature-fall, etc., can be drawn in with reference to it and the 20° fall curve. Where the isothermal lines representing these computed temperatures are irregular in appearance, they can be improved upon somewhat by smoothing them out so as to represent a mean position of the computed isotherms.

The method of forecasting cold waves described is best adapted to that part of the country east of the Mississippi River and south of the Ohio River, and for the States of Missouri, Arkansas, Texas, and Louisiana. In this region the forecasts of cold waves will be more trustworthy than heretofore, as there is a good opportunity to make an exact measurement on the map of the extents of high and low areas of pressure and the isothermal number, the factors on which the cold wave depends.

For North and South Dakota, Minnesota, and Montana, it is not possible to derive any great advantage from this method, the measurements of the high areas of pressure preceding cold waves not being possible, as they extend into a region outside of observation. However, for types of cold waves in this region dependent on low pressures, not accompanied by highs, the method will make some improvement in the forecasts.

When the low area of pressure is bordering on the ocean its limits are, of course, unknown, and estimates of its extent will necessarily be uncertain.

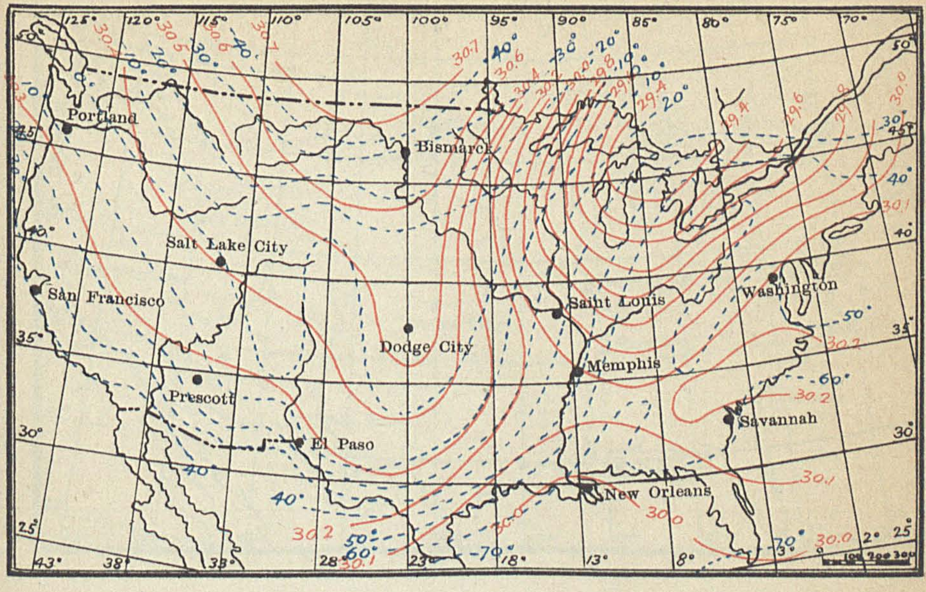
For this reason the method will not give much of an improvement in the forecasts of cold waves in the New England States, especially as in that section the areas of the high pressure will pretty generally be unknown, being north of the Dominion of Canada, in a region without any observing stations. The method of computing the maximum fall of temperature, which will be applicable in this case, however, will produce some improvement in the forecasts.

The greater the cold wave the greater the chance of successfully forecasting it. Taking into consideration the probable error of the extent of a cold wave, as determined by this method, ± 5.4, it would seem advisable to forecast only such cold waves as have an extent of at least 15.

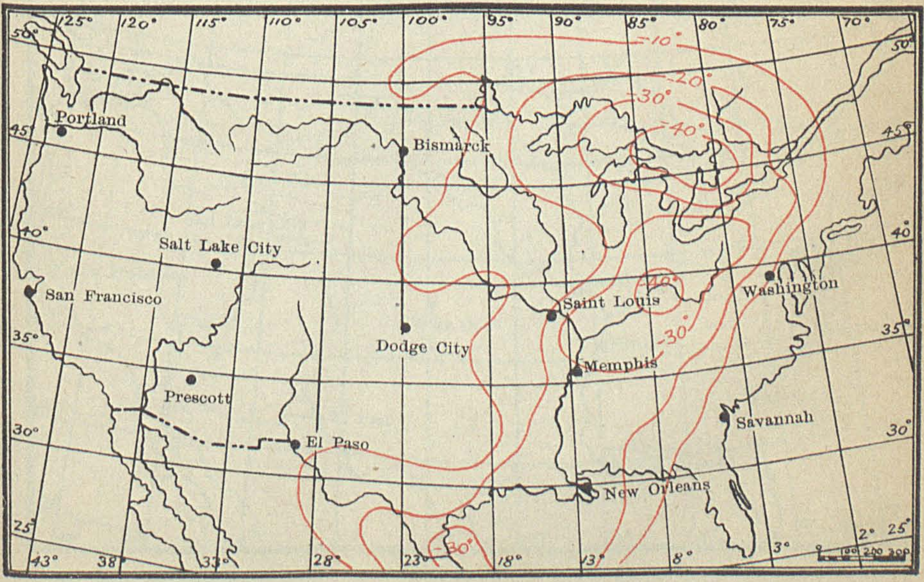
In very rare cases, such as that of Chicago, on March 4, 1881, this method would have been almost a complete failure.

The extent of temperature-fall as derived by this method will, in some cases be much too small and in some cases too great. For the greater number of cases it will give a result agreeing somewhat nearly with the temperature-falls that actually occur.

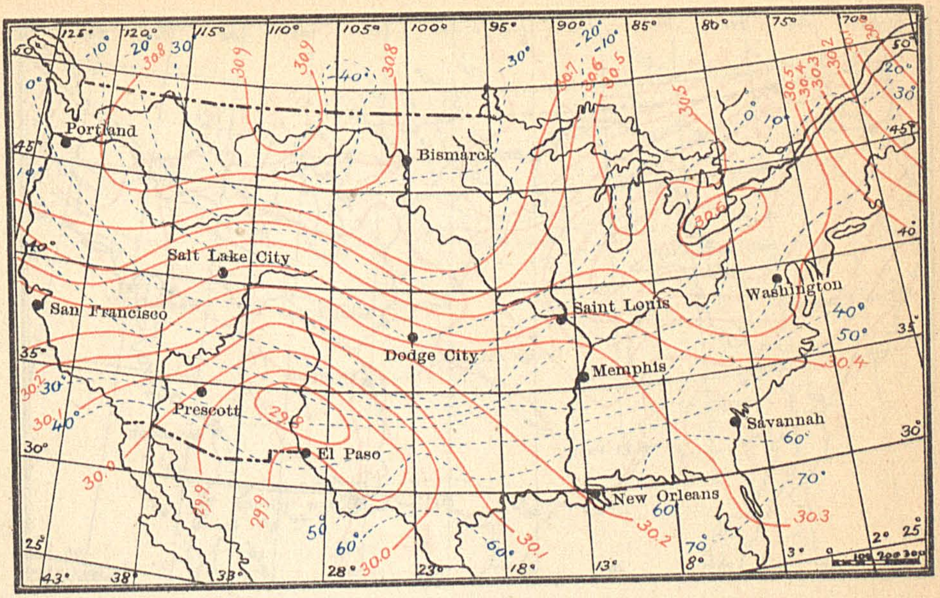
Weather Map Decembr 31 1884 7 A. M. Appendix No. 5



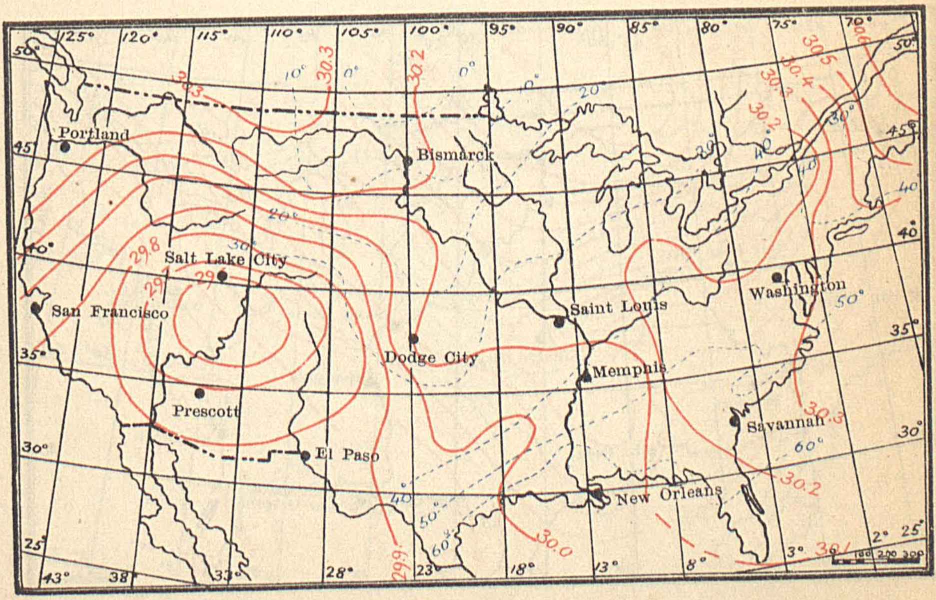
Twenty four hour, Temperature fall lines. Jan. 1. 1885 7 A. M. Appendix No. 5



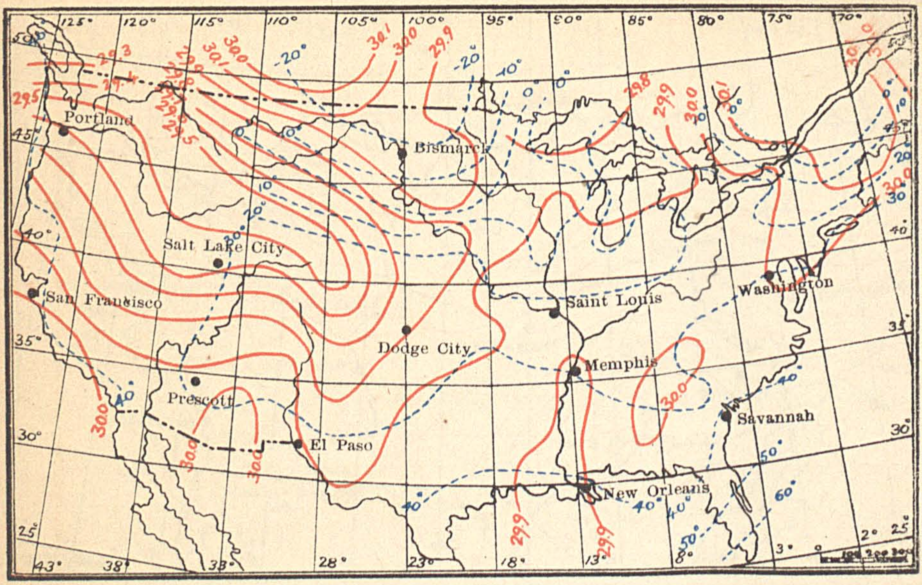
I January 14 1888 Appendix No. 5



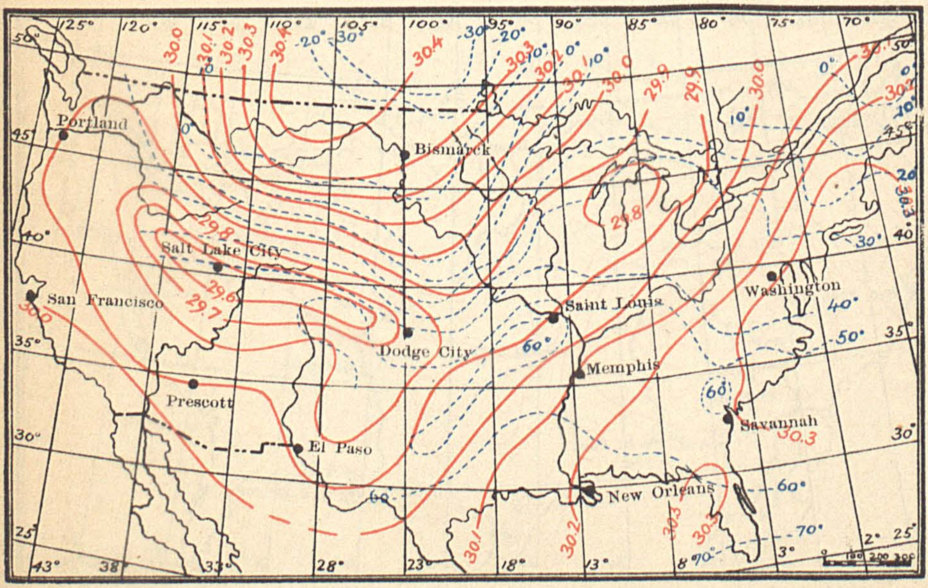
II. November 25 1887 Appendix No 5



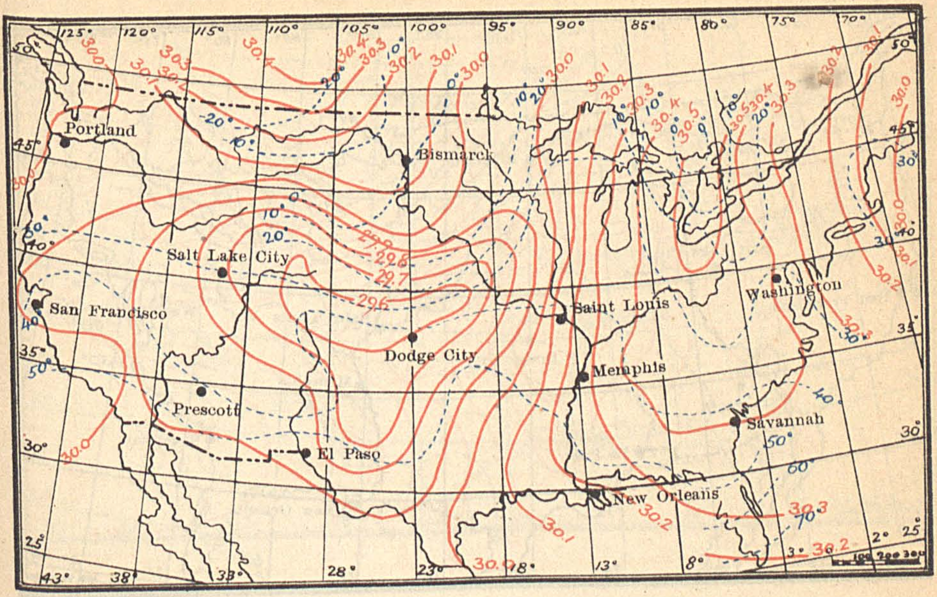
III December 26 1887 Appendix No 5



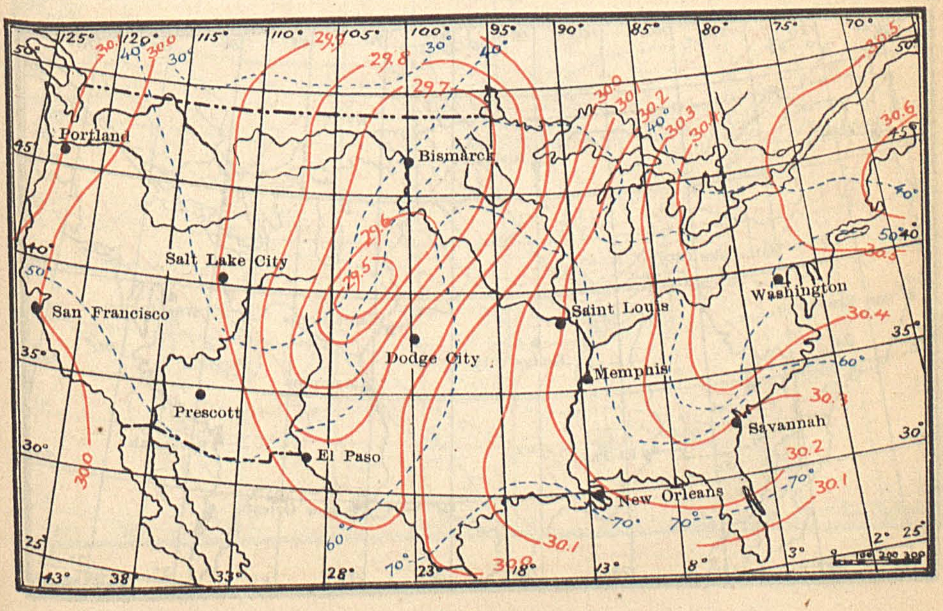
IV February 10 1887 Appendix No. 5



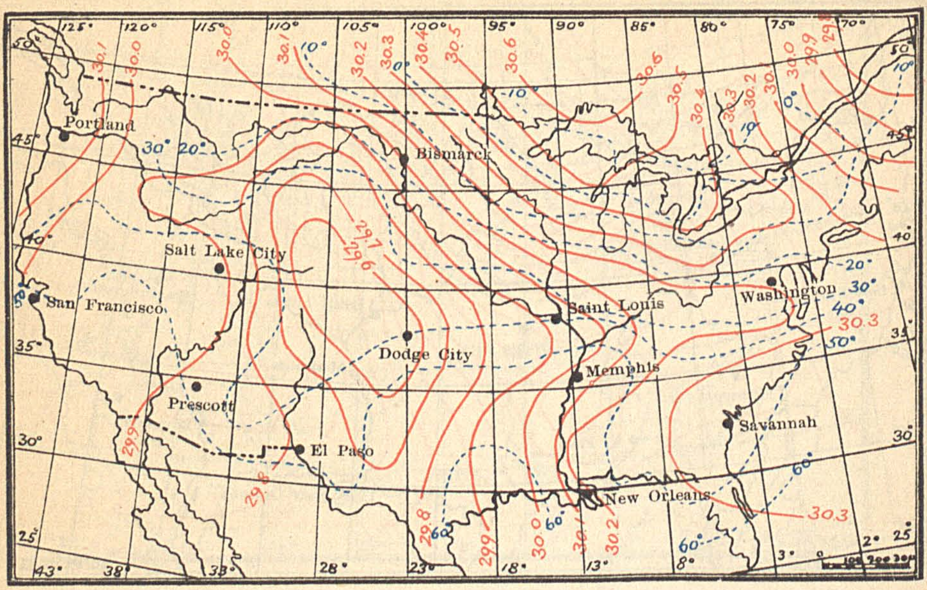
V March 9. 1888 Appendix No 5



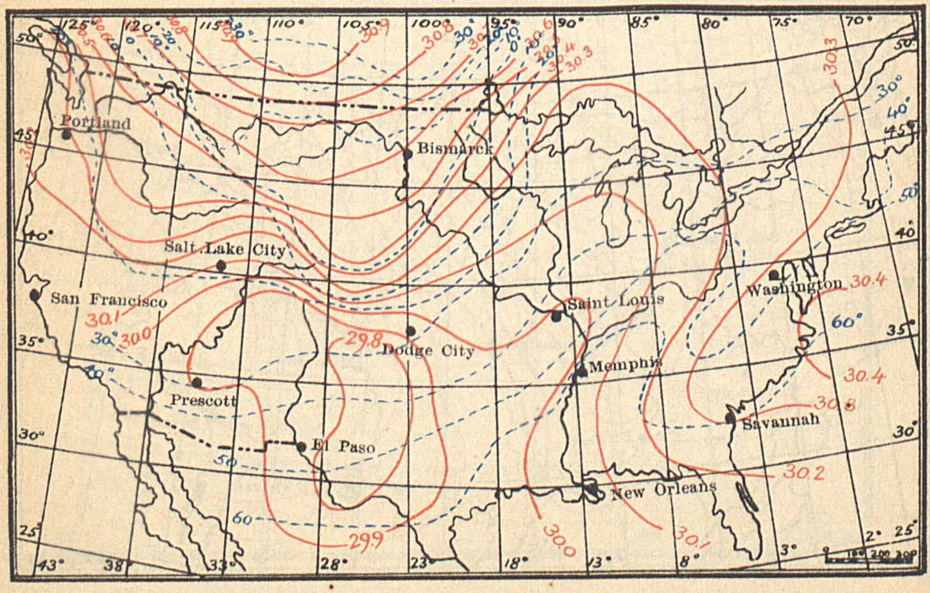
VI October 19 1886 Appendix No.5



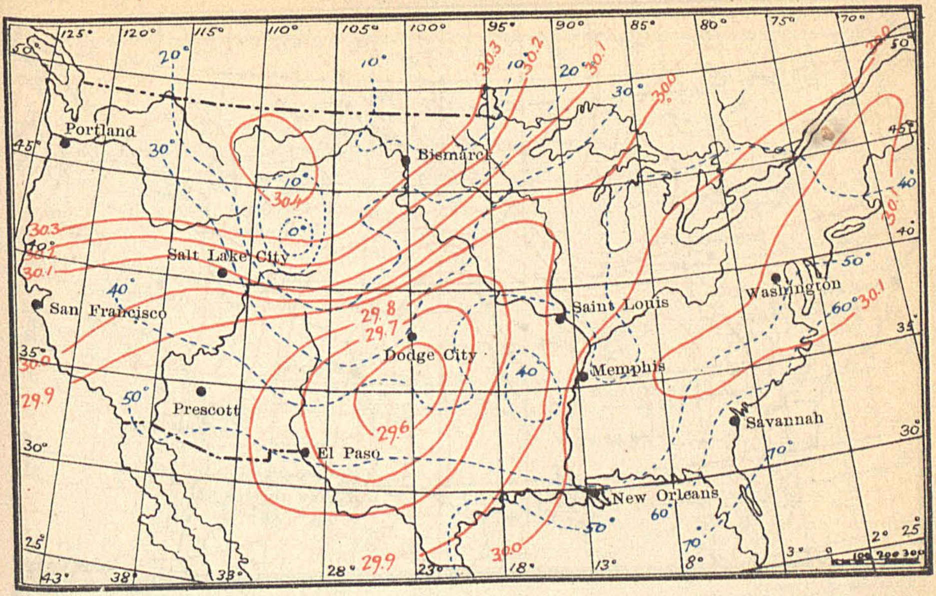
VII March 24 1888 Appendix No. 5



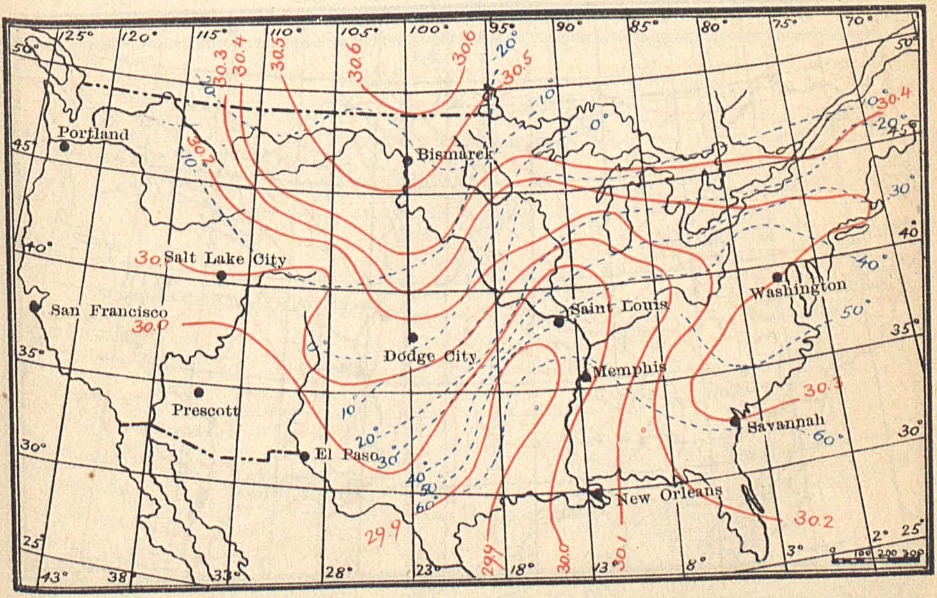
VIII November 26. 1887 Appendix No. 5



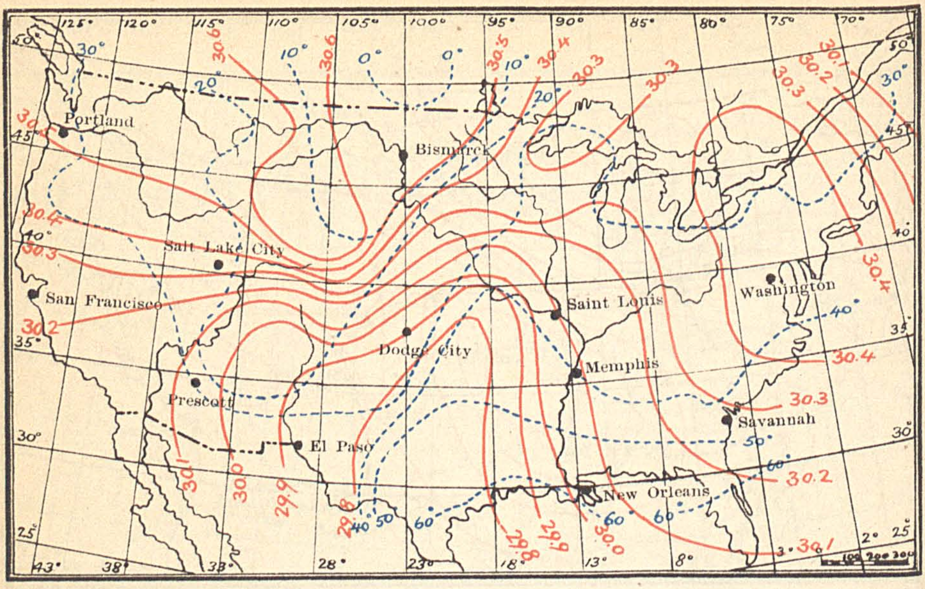
IX *November 11. 1889* Appendix No.5



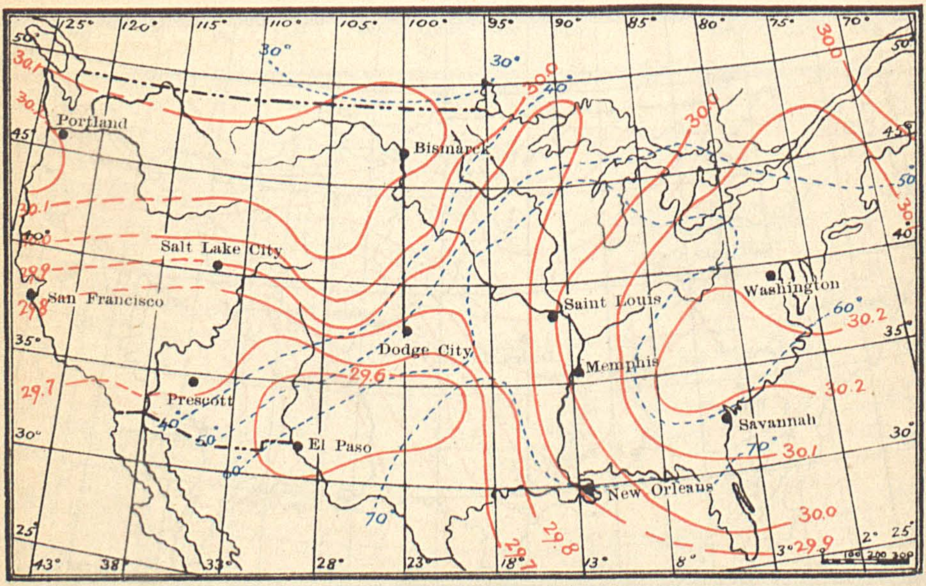
X *February 12 1884* Appendix No.5



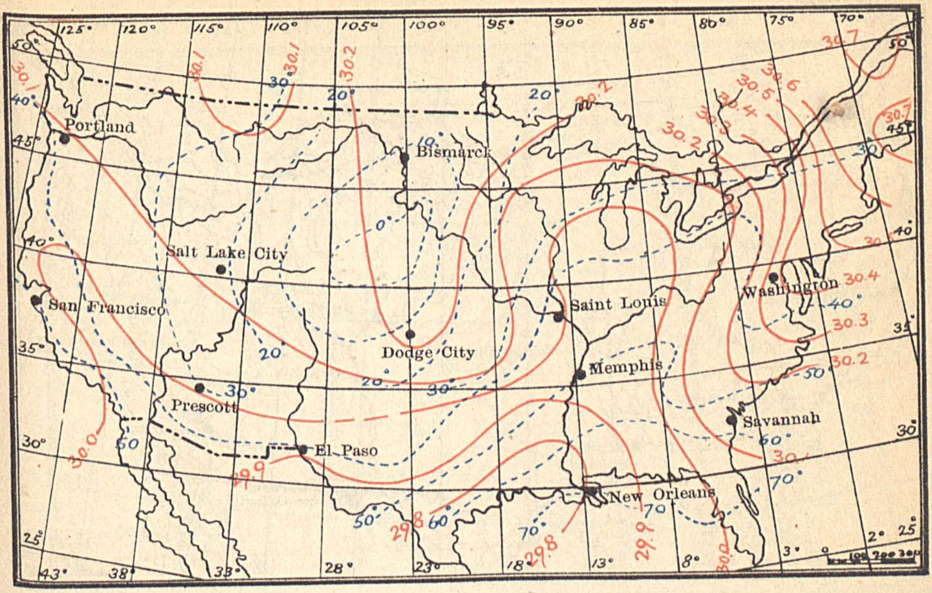
XI November 16 1886 Appendix No. 5



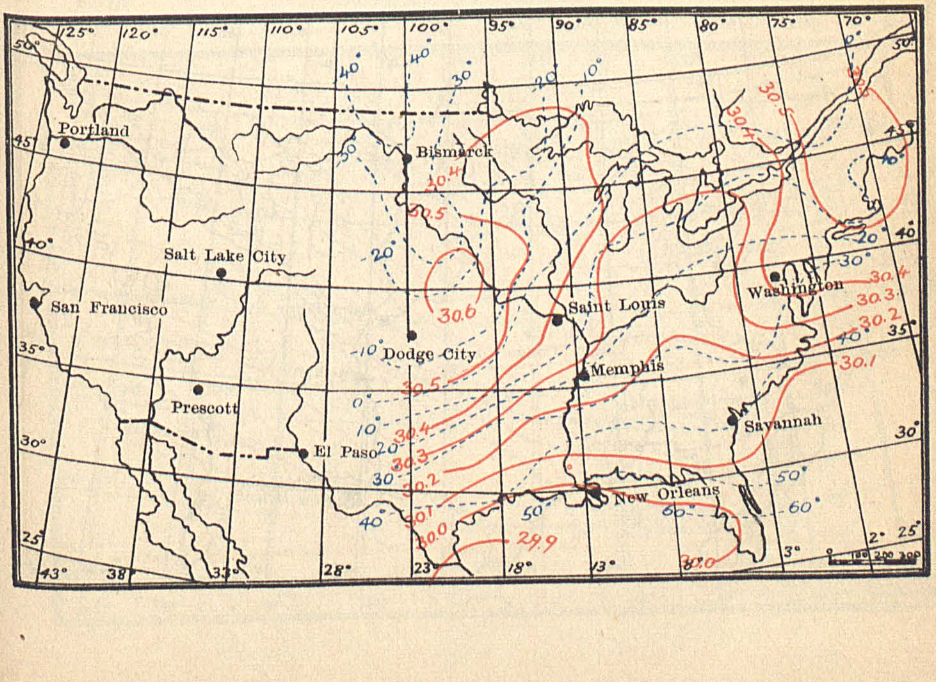
XII October 8. 1887 Appendix No. 5



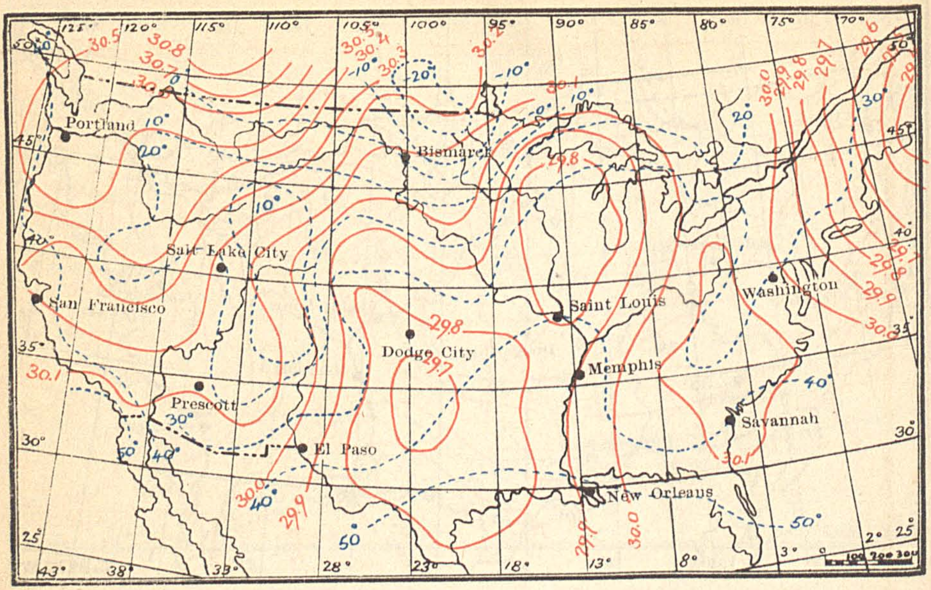
XIII March 29 1886 Appendix No. 5



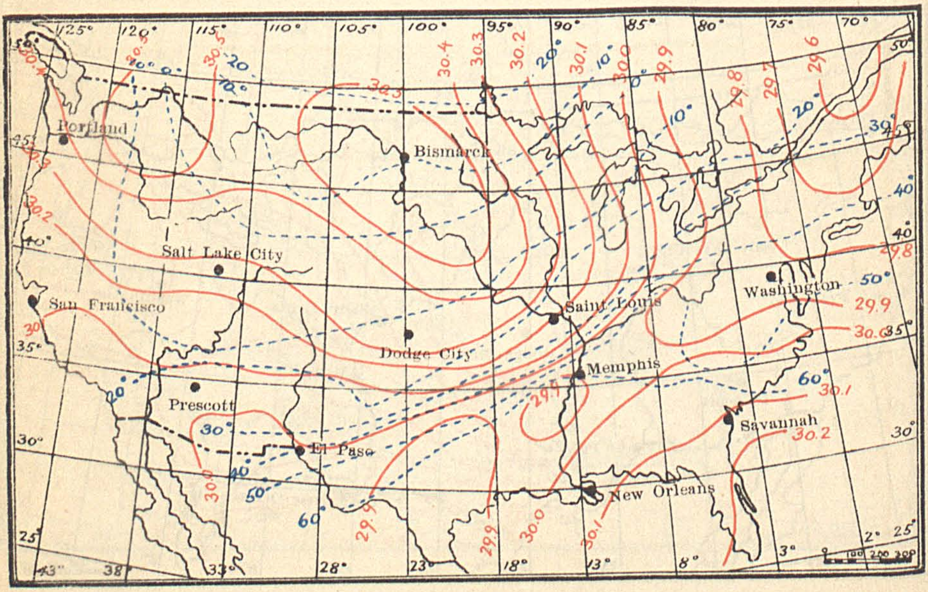
XIV January 9. 1881 Appendix No. 5



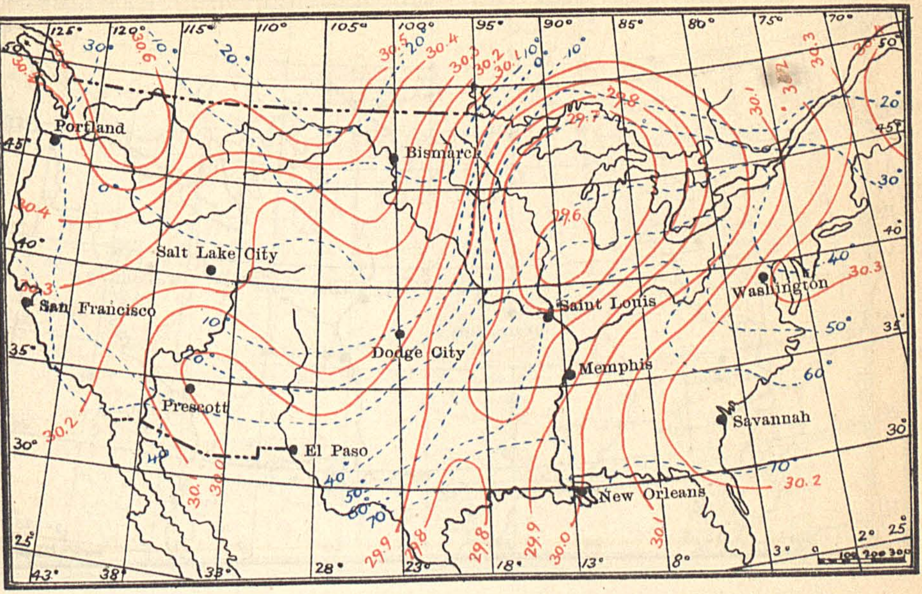
XV December 19. 1887 Appendix No. 5



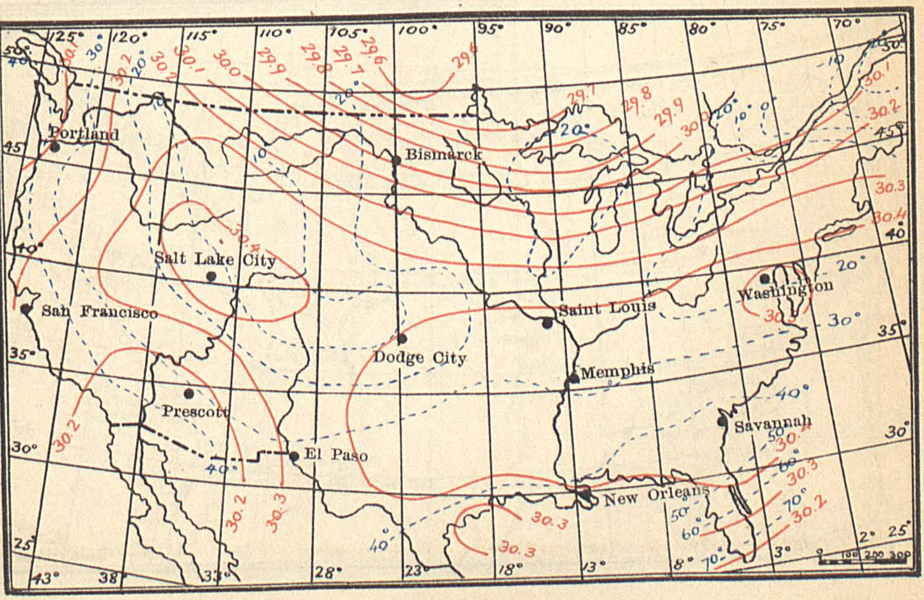
XVI January 16. 1882 Appendix No. 5

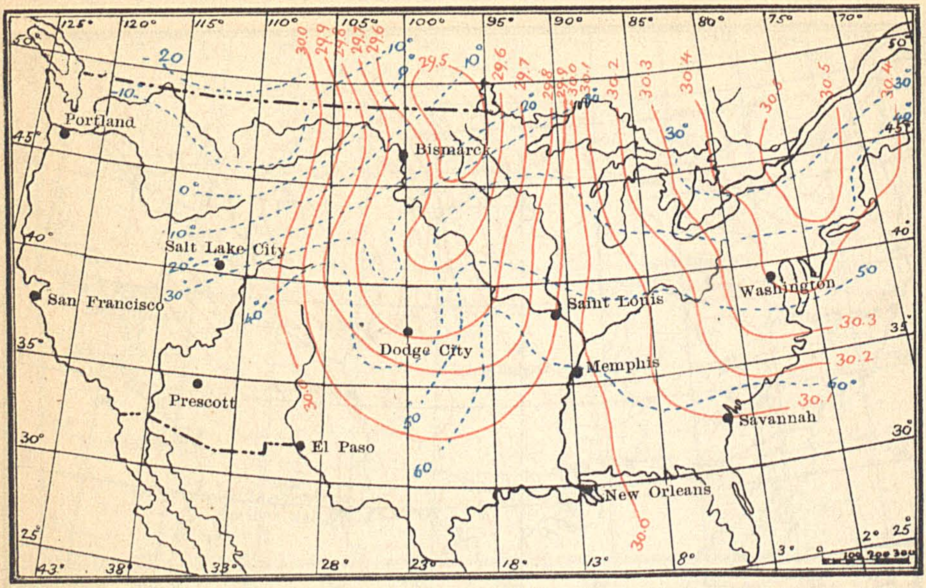


XVII February 16 1883 Appendix No. 5



XVIII January 17 1884 Appendix No. 5




Portland
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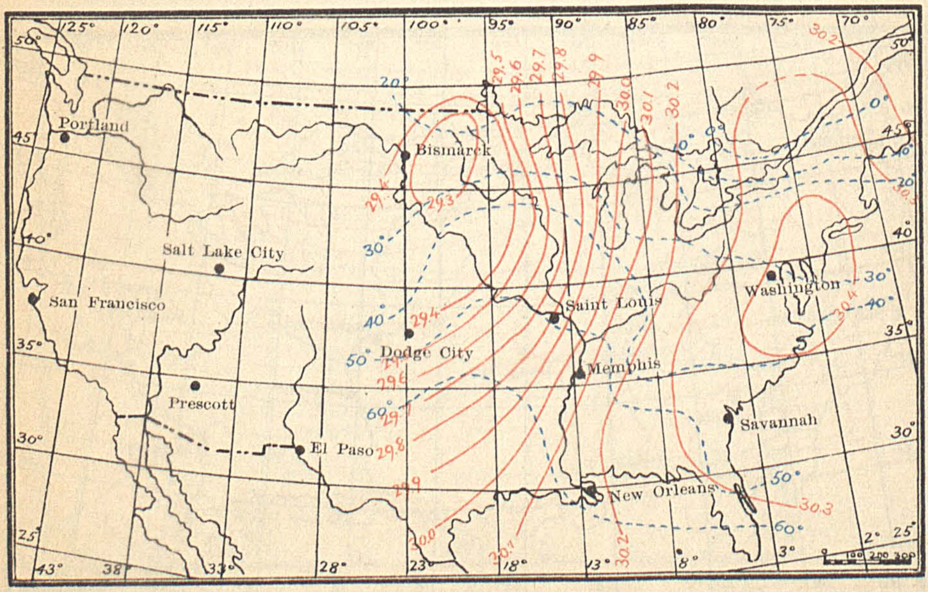
Salt Lake City
San Francisco
Washington
Saint Louis
Dodge City
Memphis
Prescott
Savannah
El Paso
New Orleans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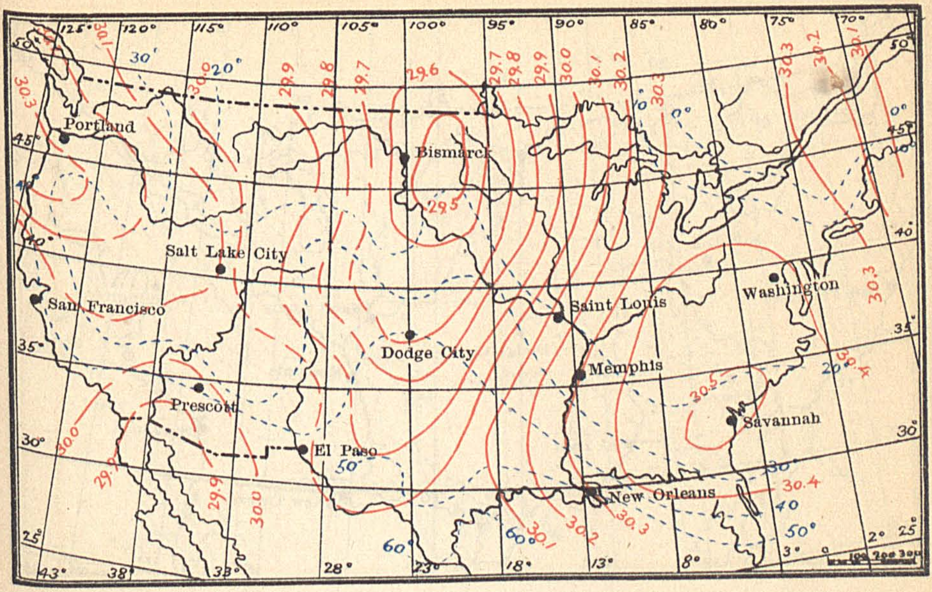
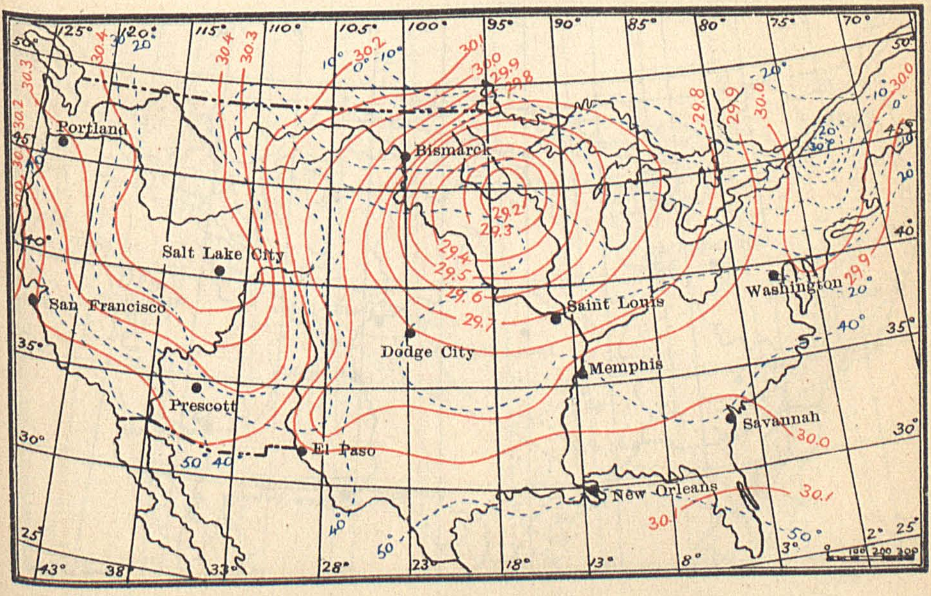
New Orleans

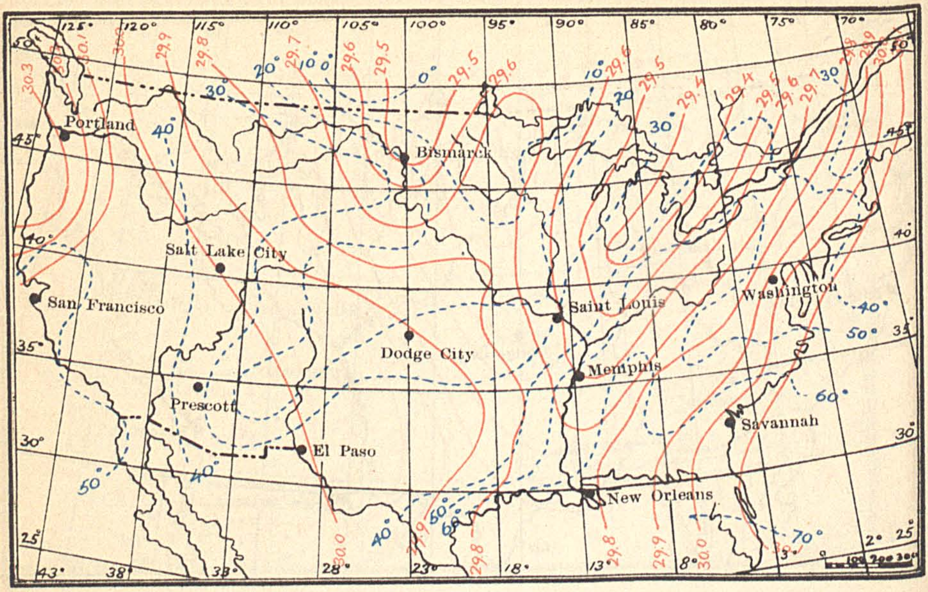
XXI. January 12 1883 Appendix No. 5.



XXII. February 4 1889 Appendix No. 5.



XXIII March 20. 1888 Appendix No. 5.



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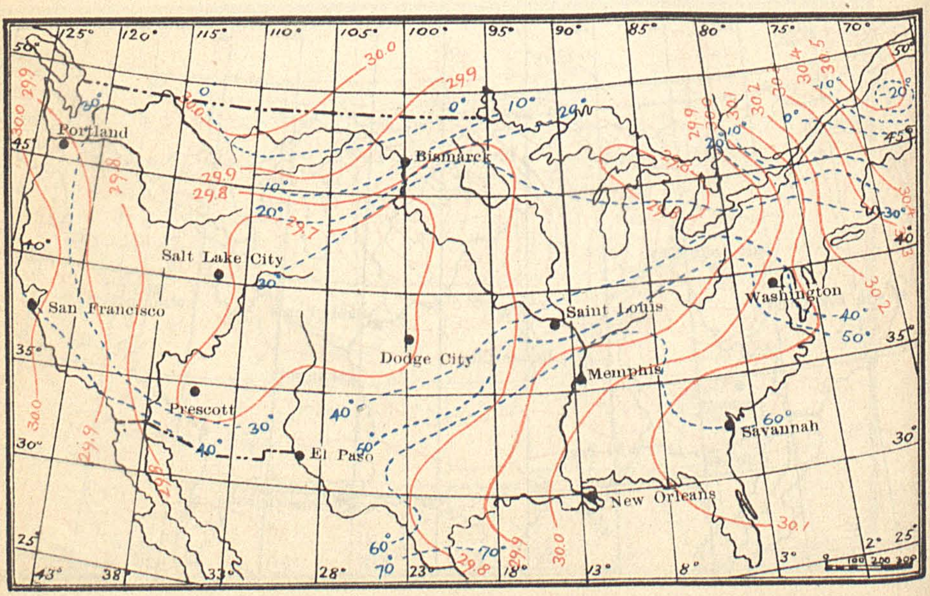
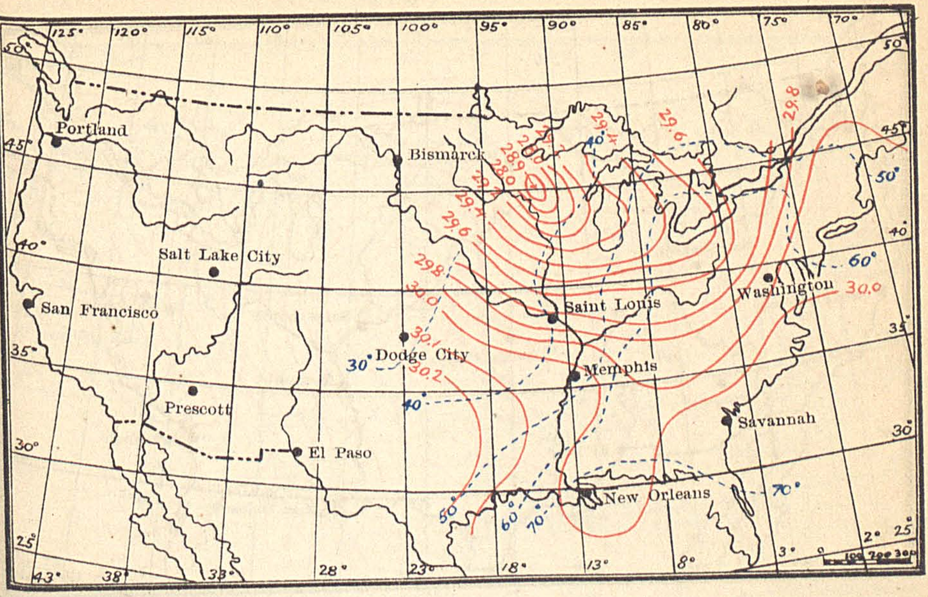
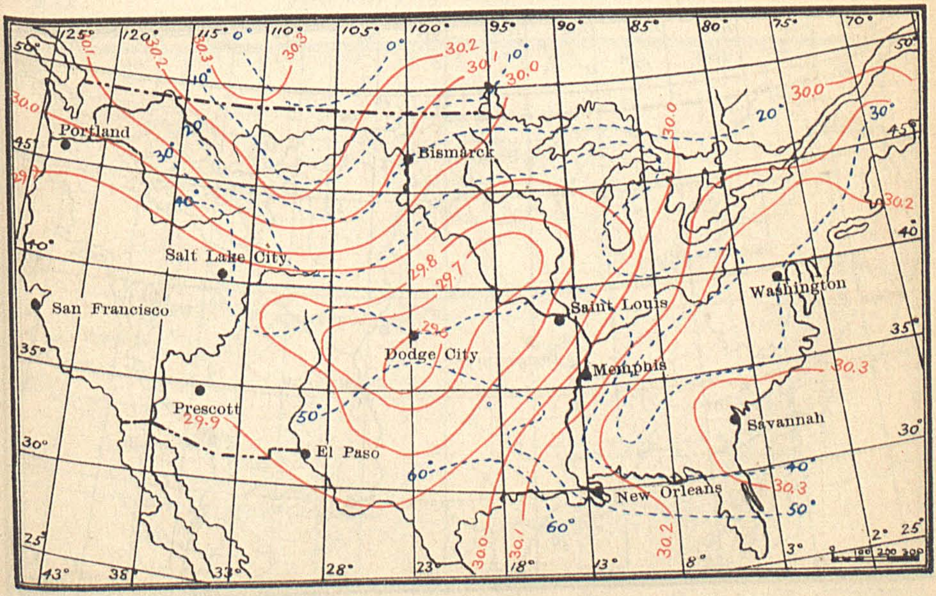


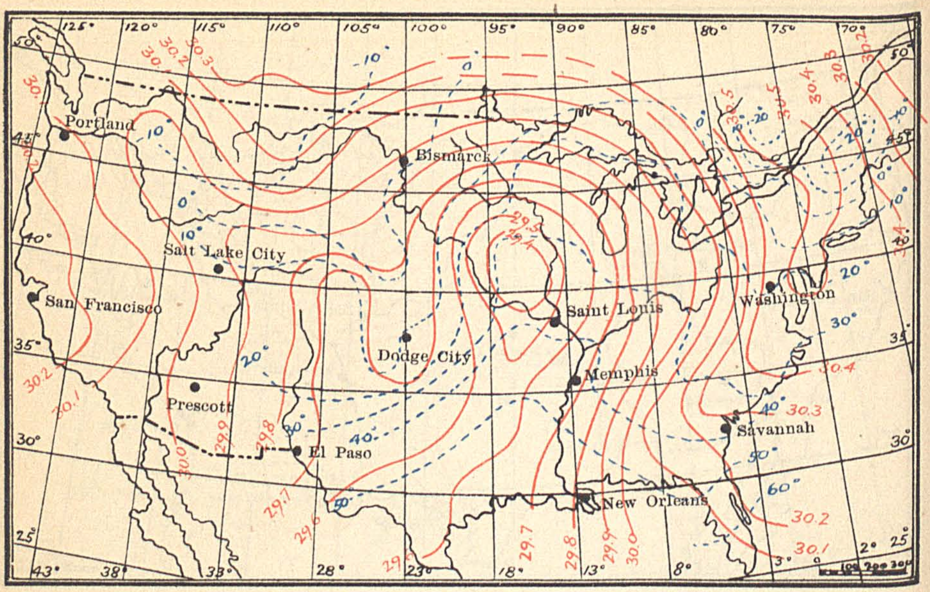
XXV October 16 1880 Appendix No. 5.



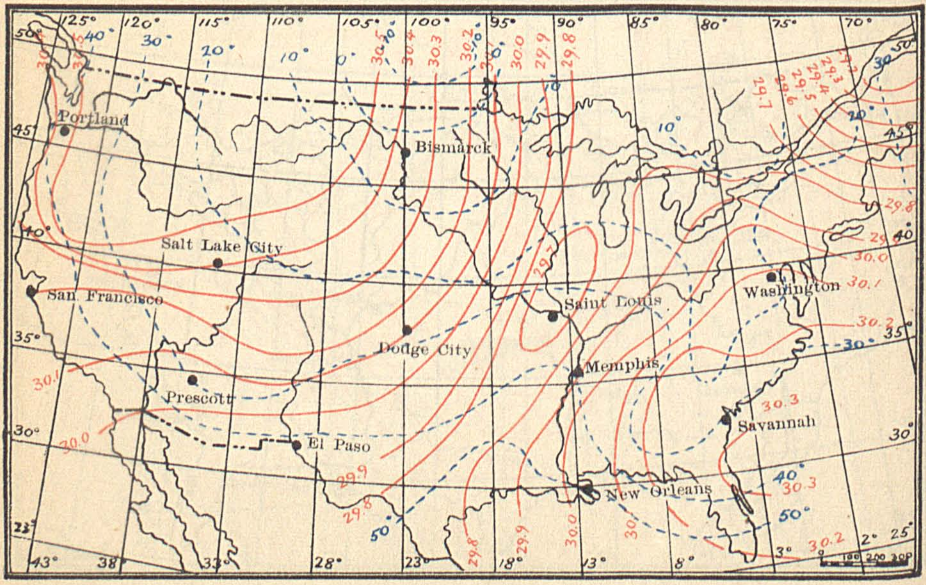
XXVI November 22 1887 Appendix No. 5.



XXVII December 31. 1887 Appendix No 5



XXVIII. January 10. 1884 Appendix No 5.



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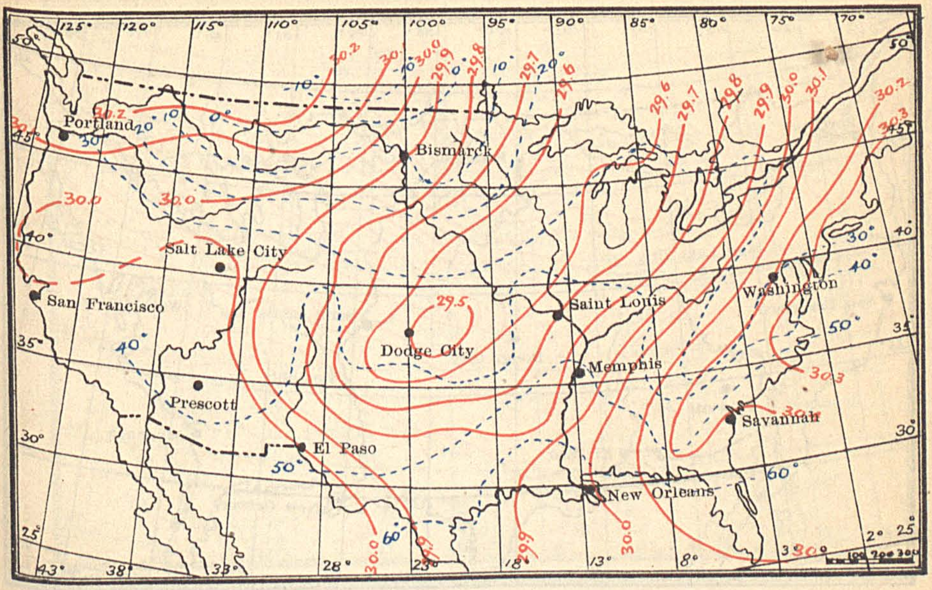
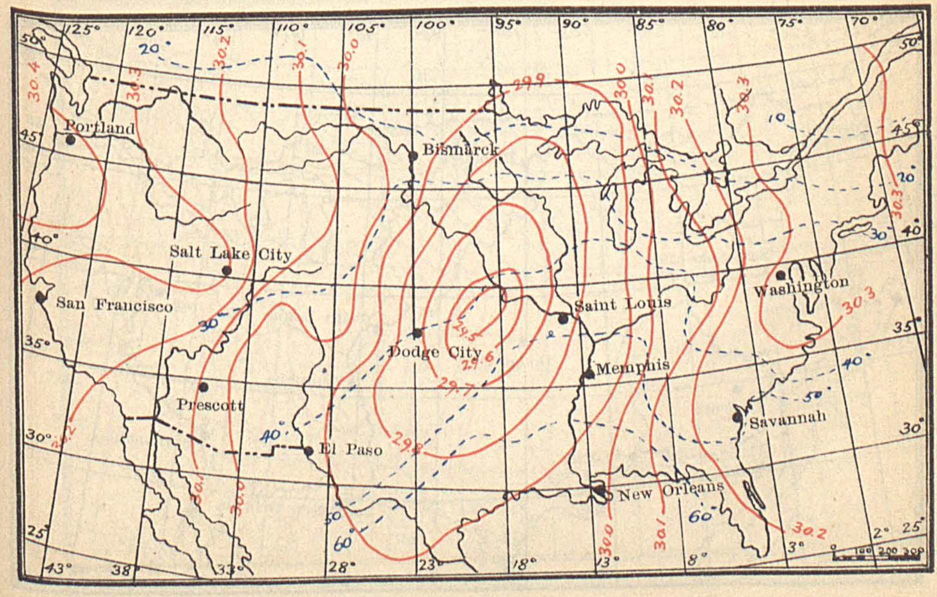


XXX February 19 1888 Appendix No 5



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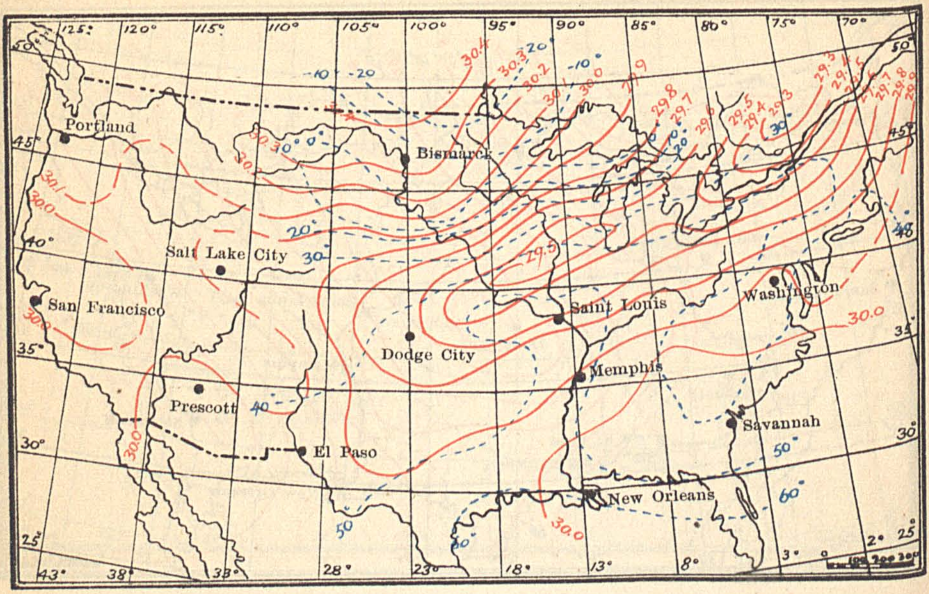

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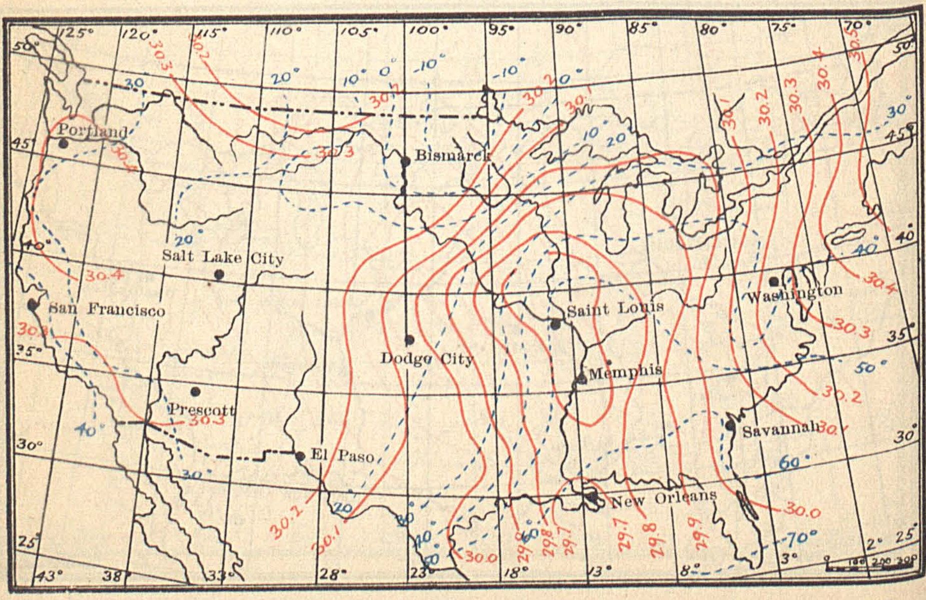

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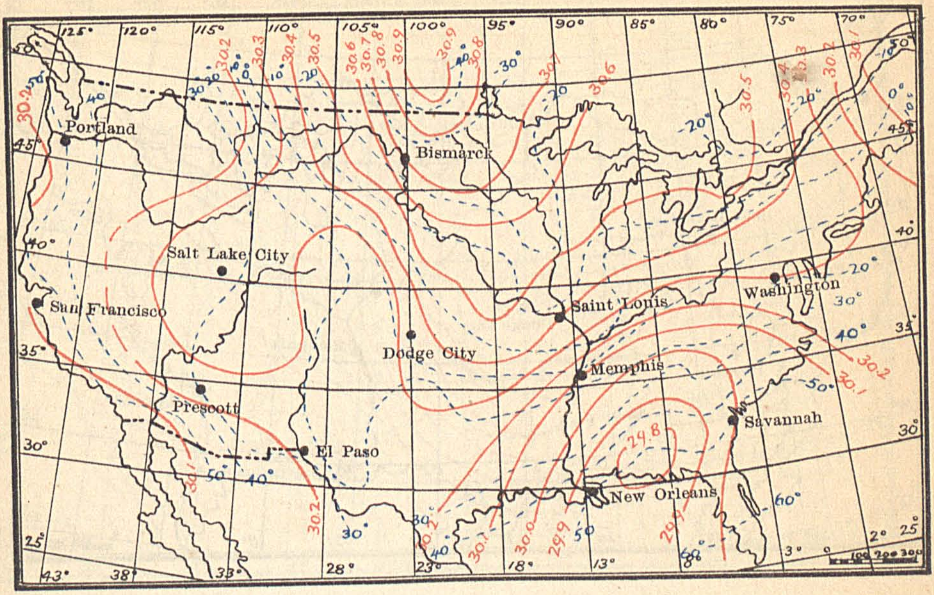

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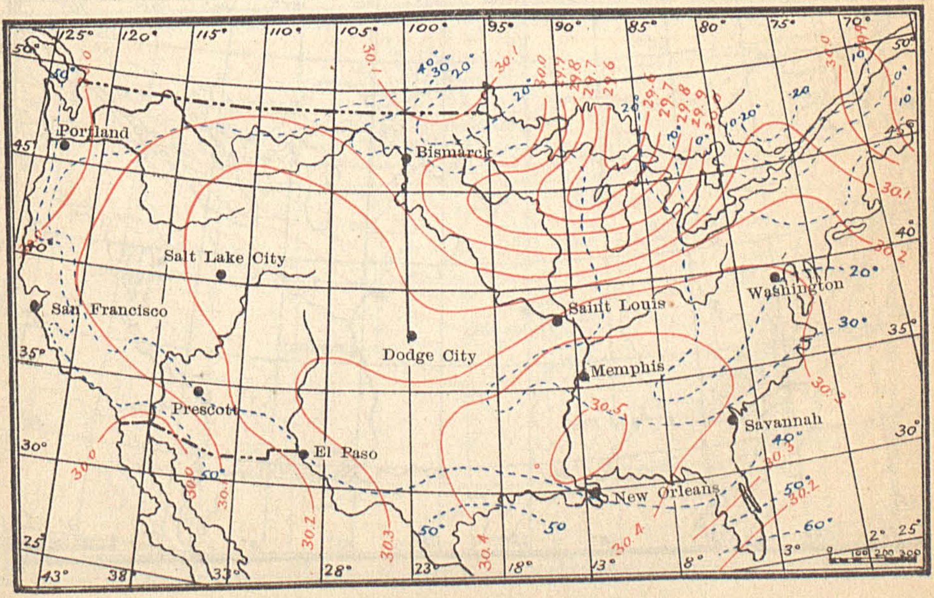

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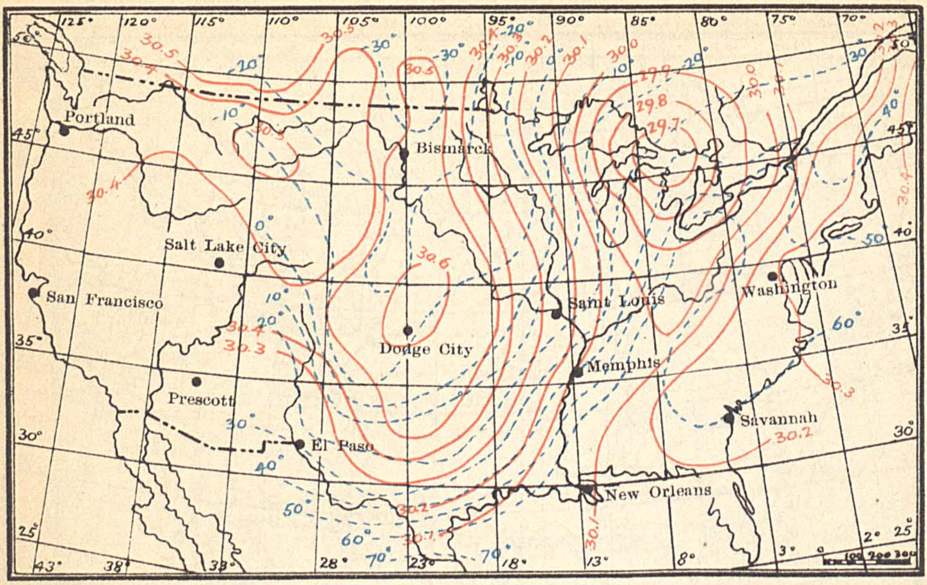

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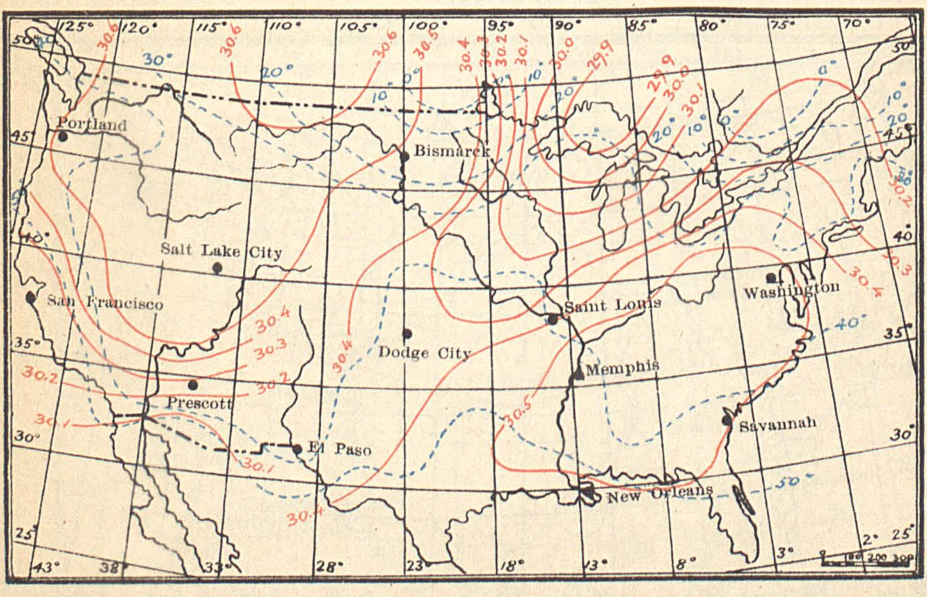

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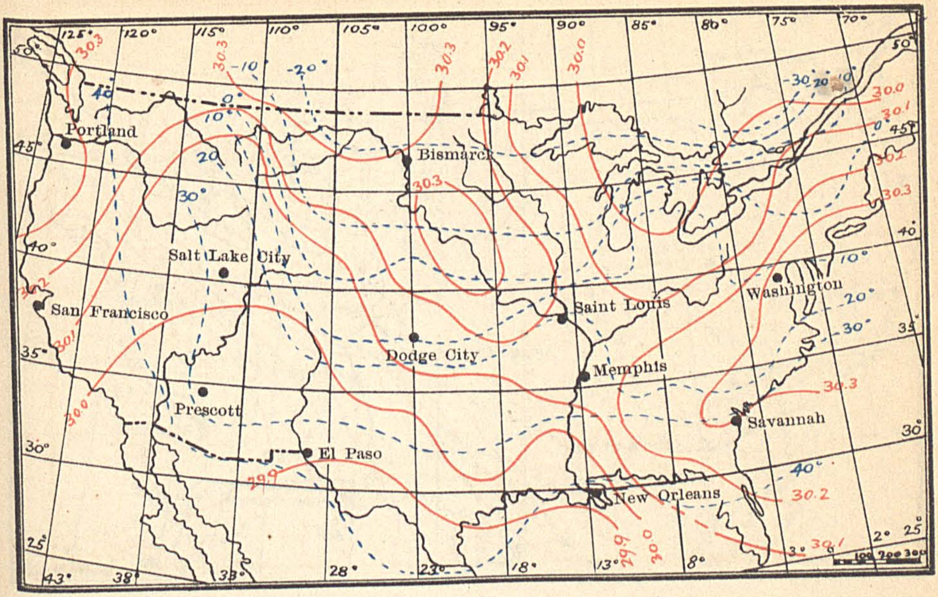

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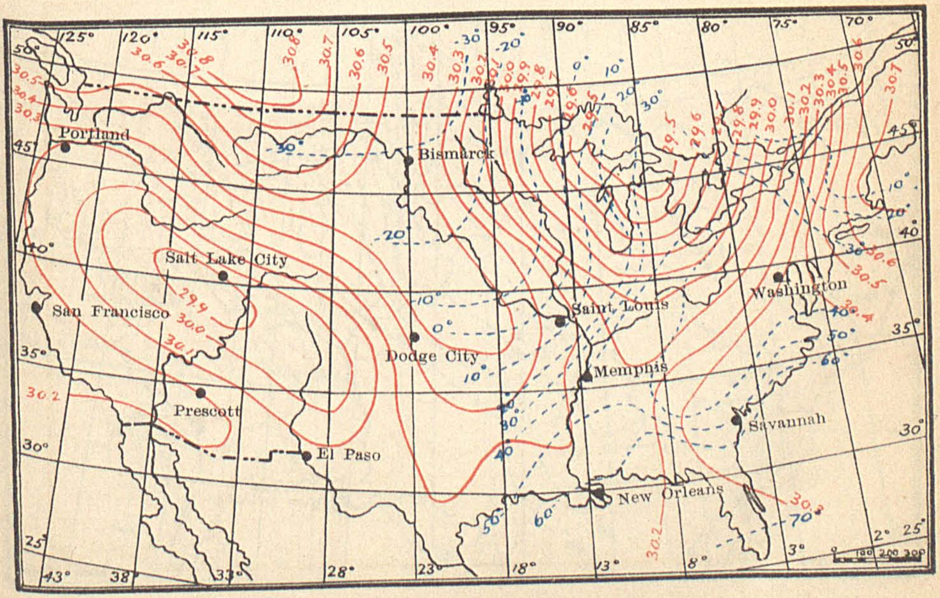

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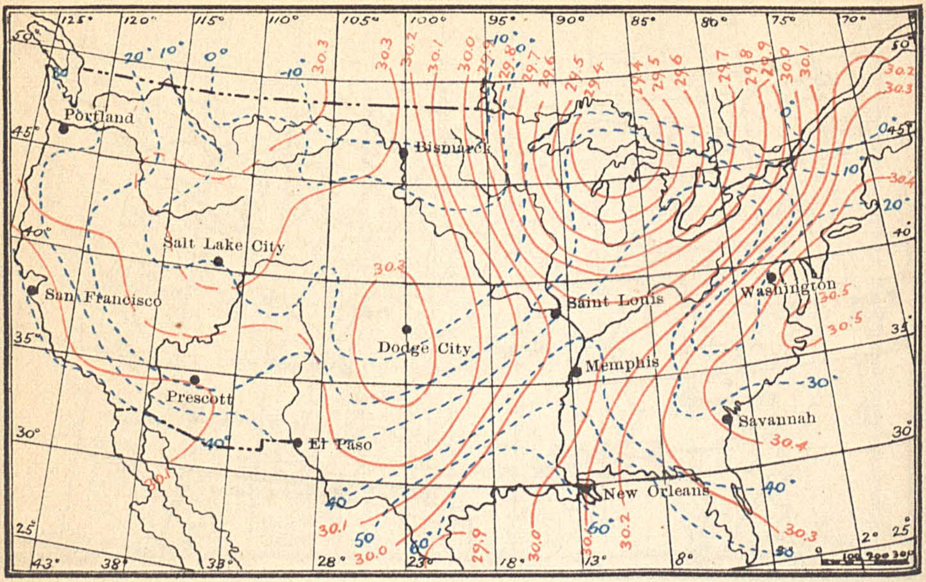
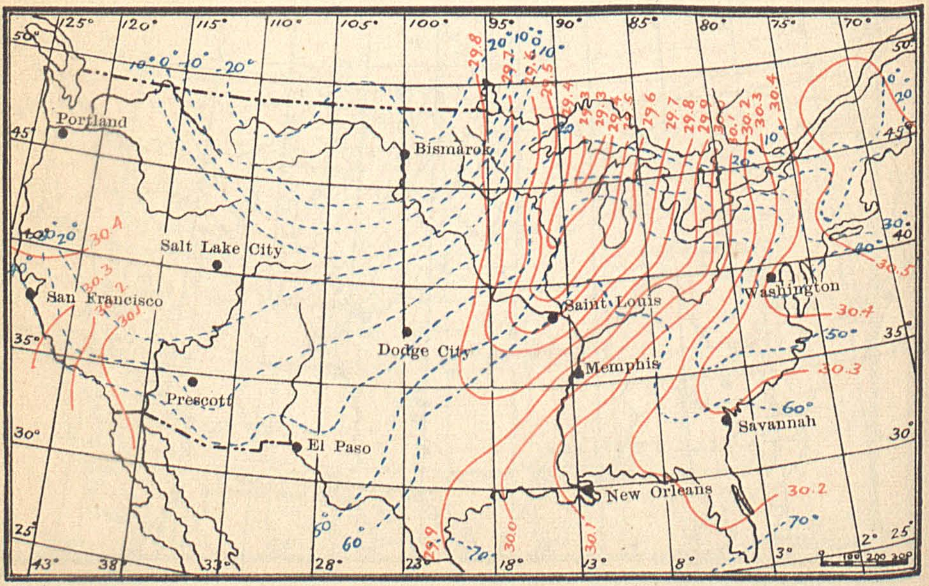


XL January 11. 1880 Appendix No. 5.



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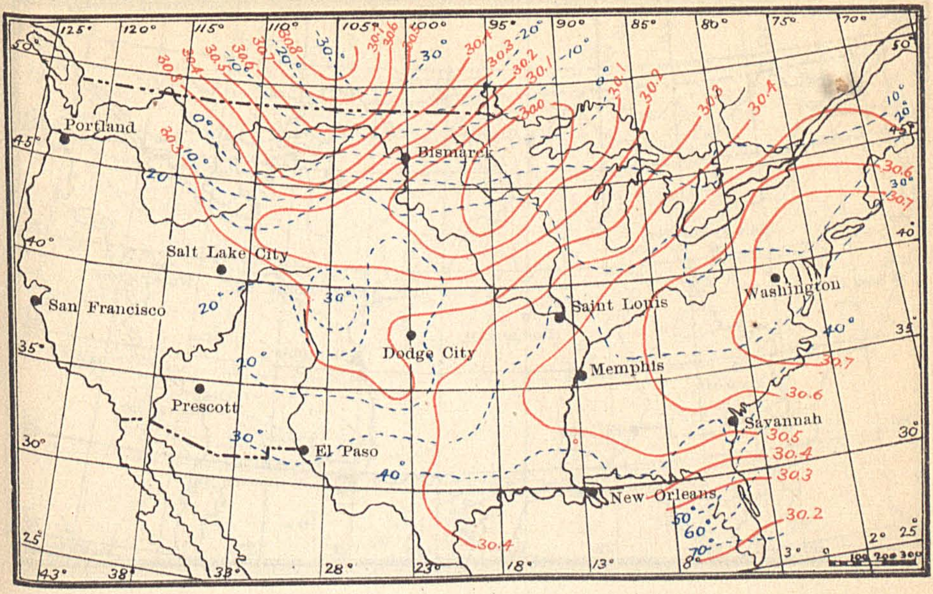

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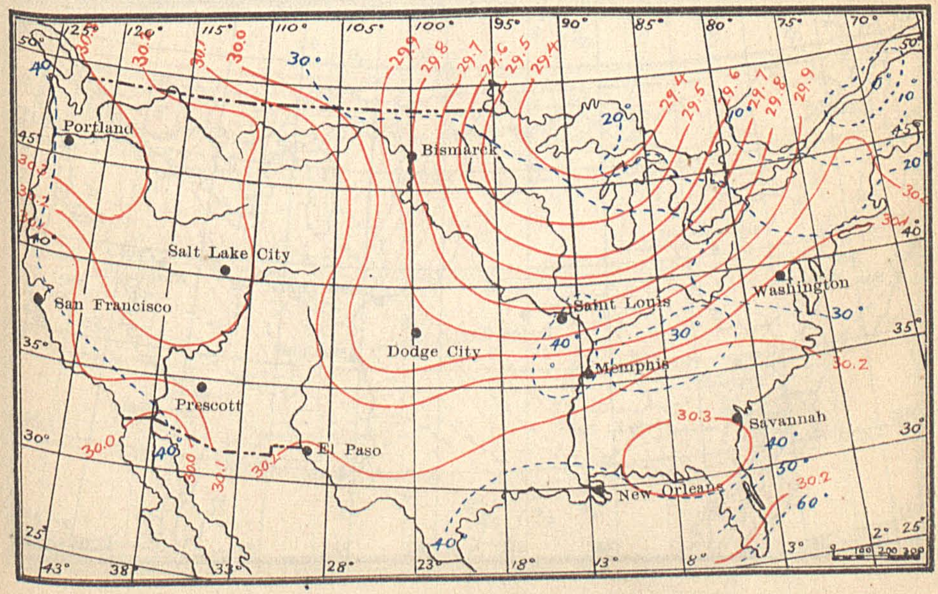

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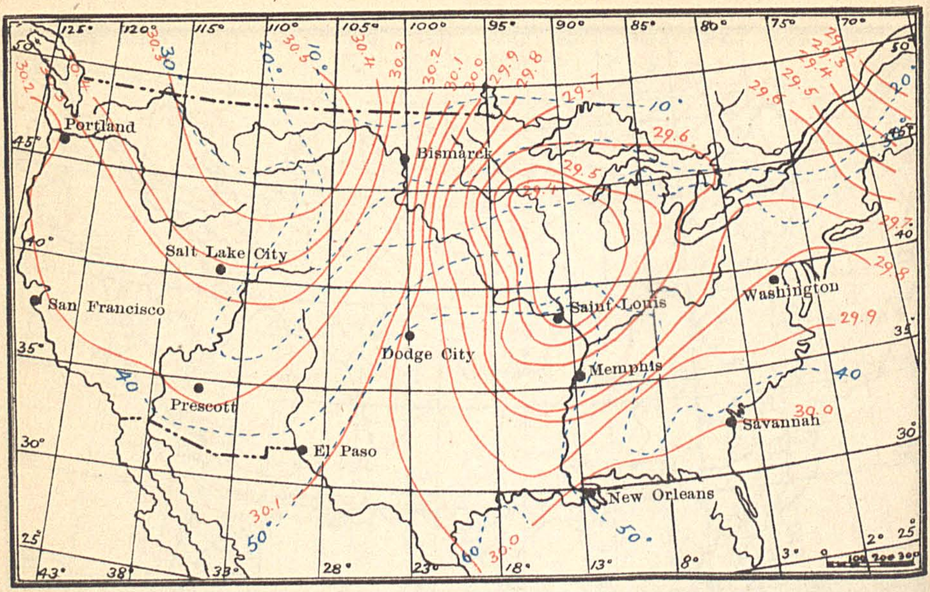

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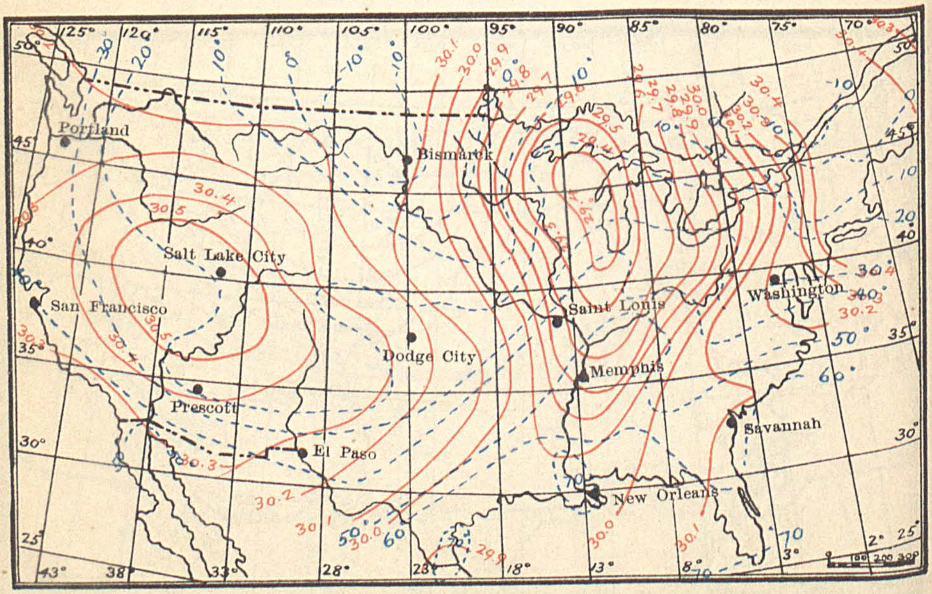

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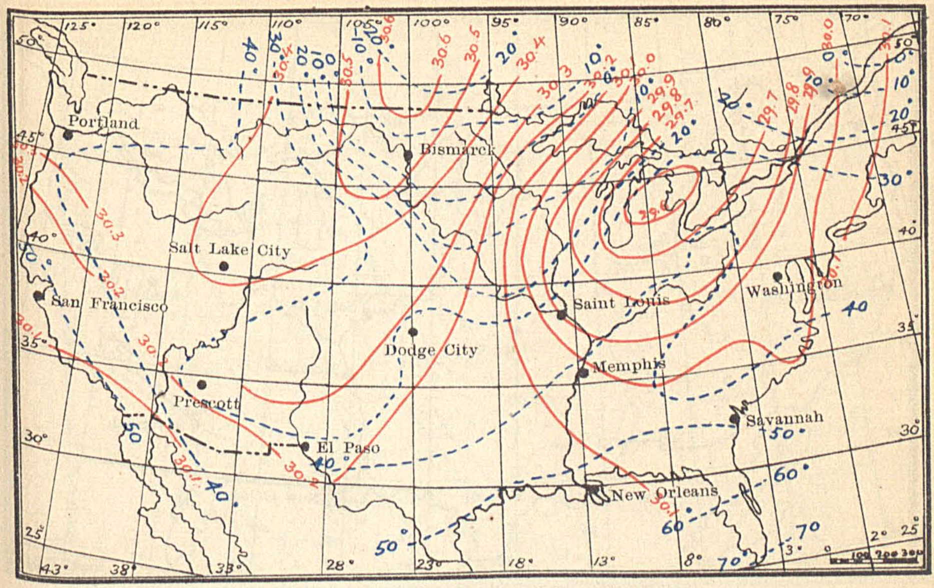

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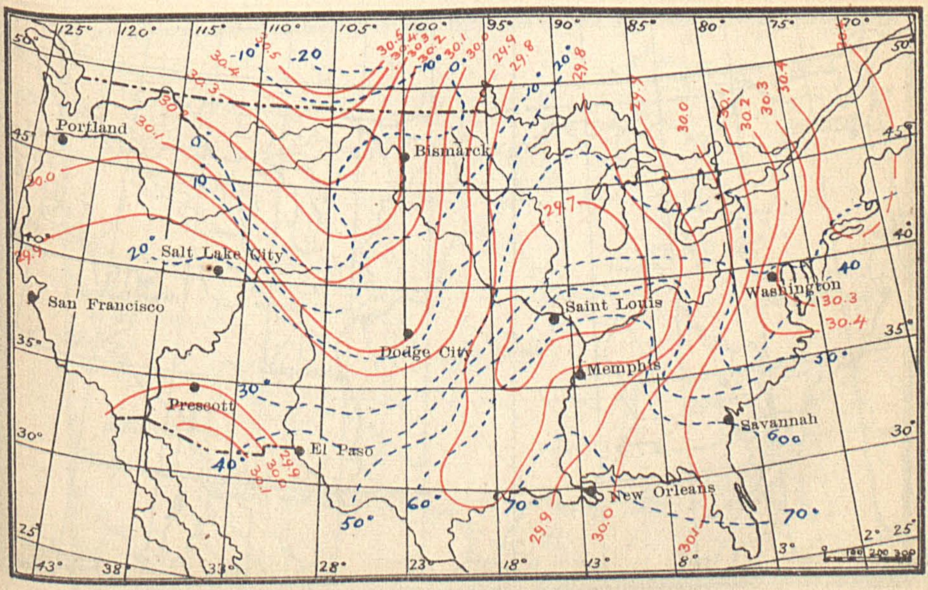

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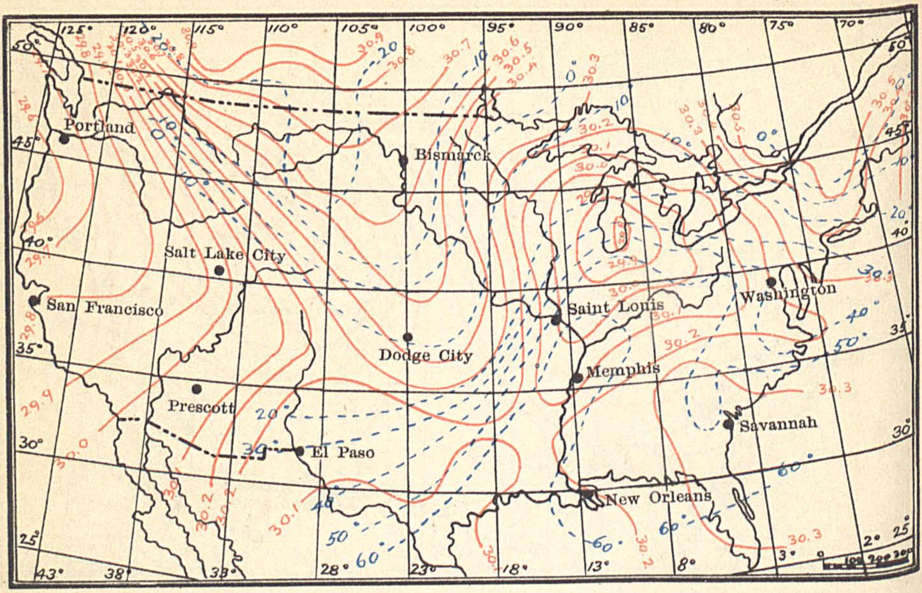

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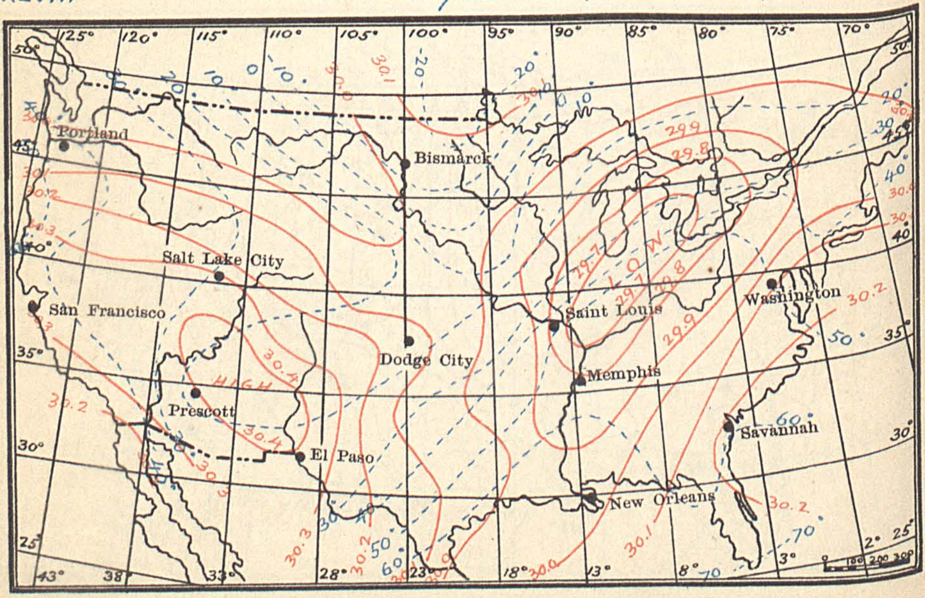

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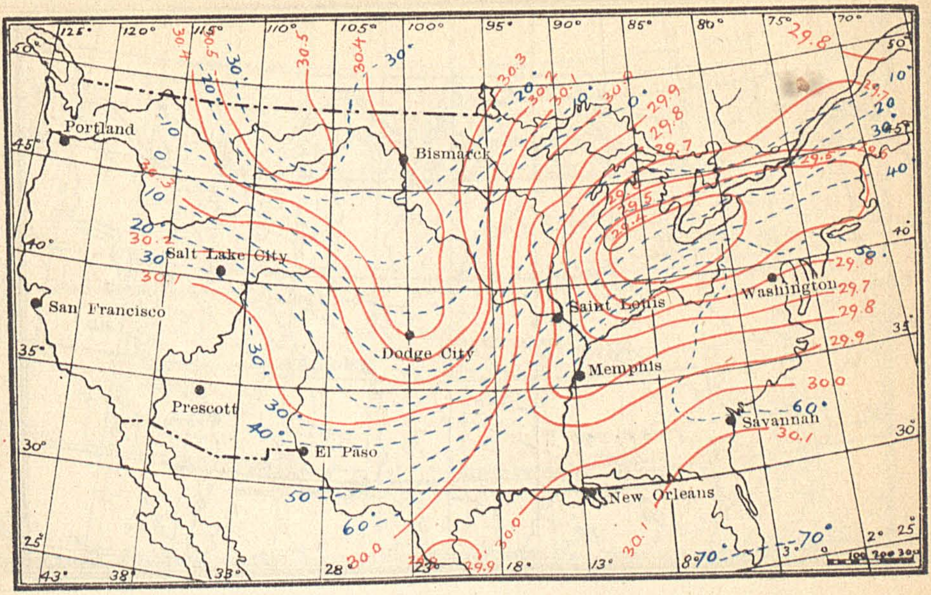

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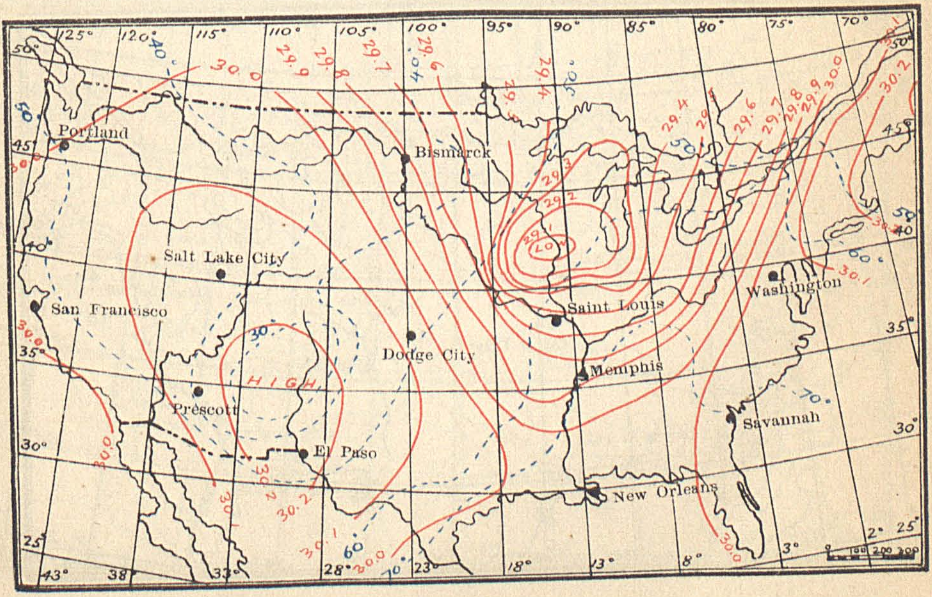

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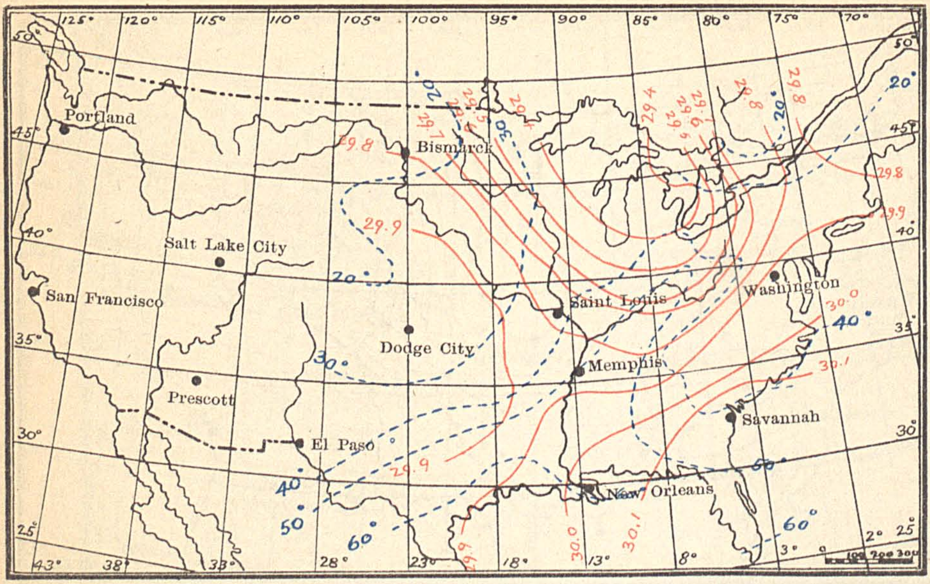

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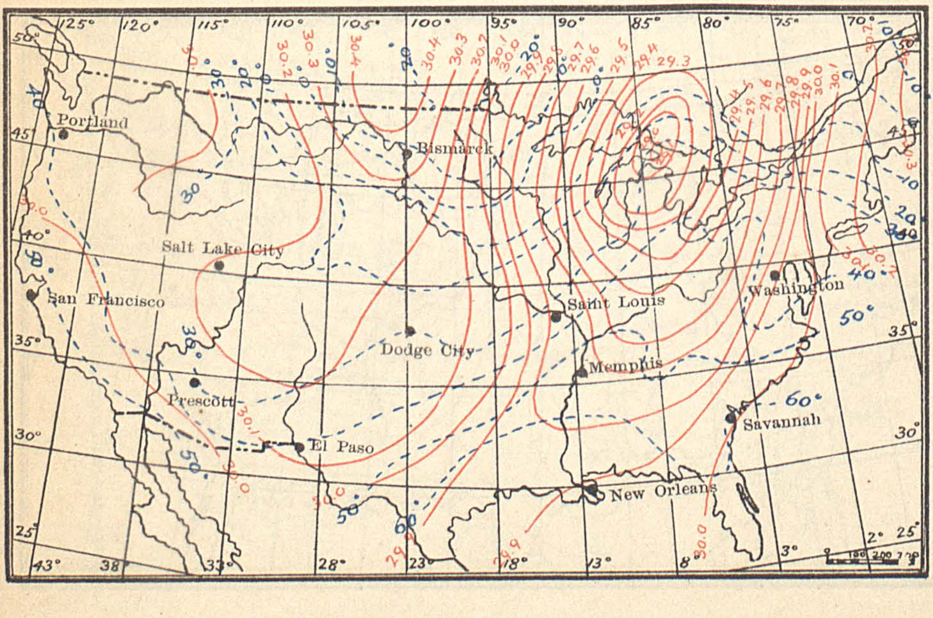
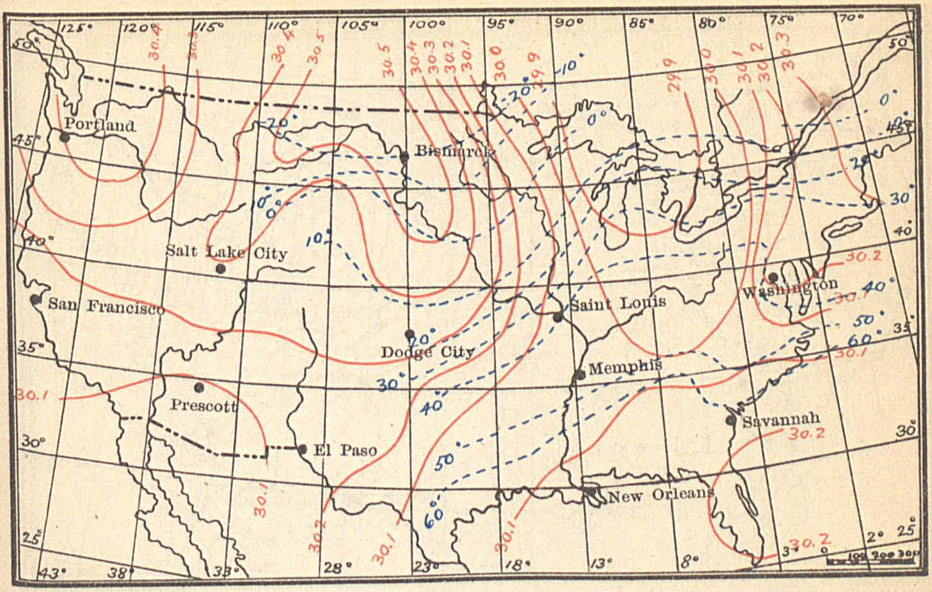


LIII January 28. 1882 Appendix No. 5



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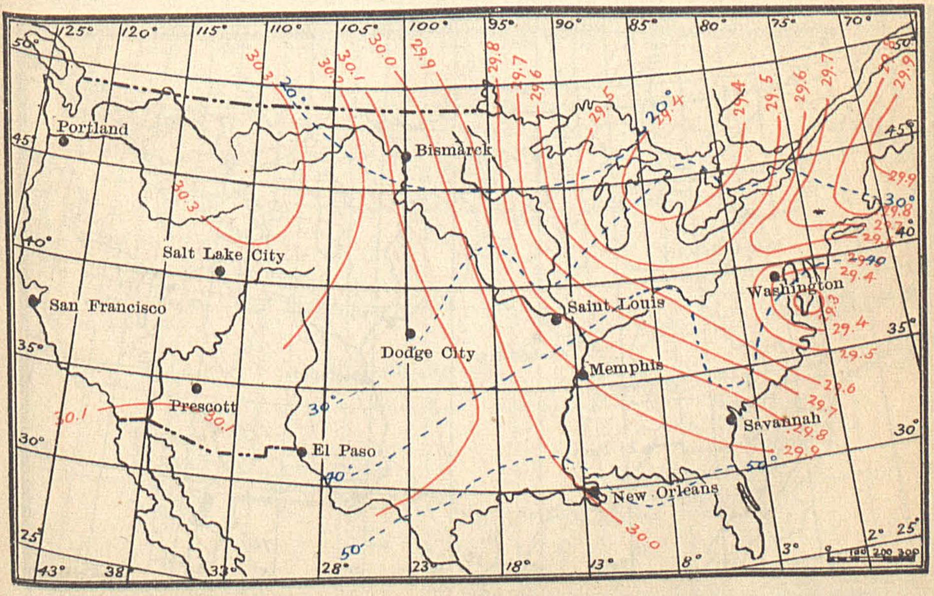

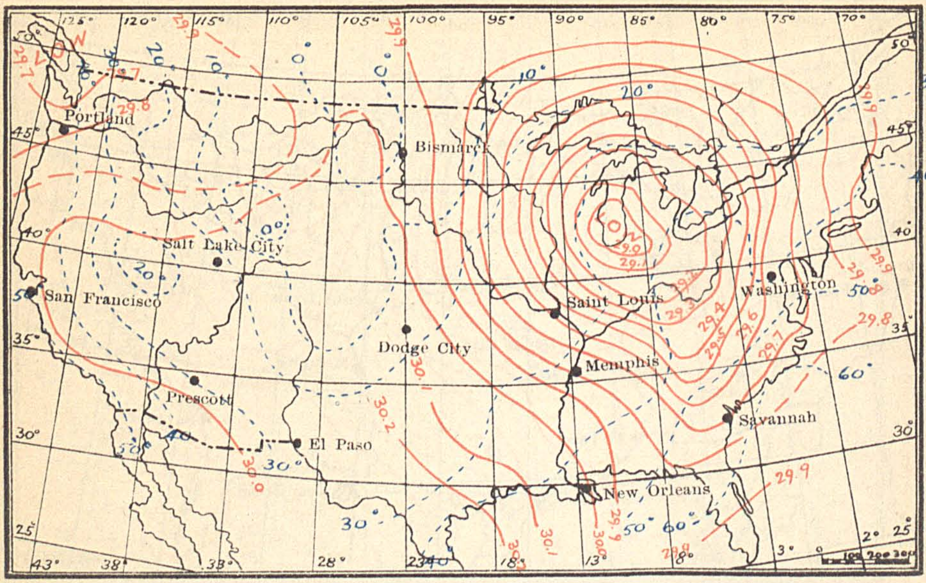
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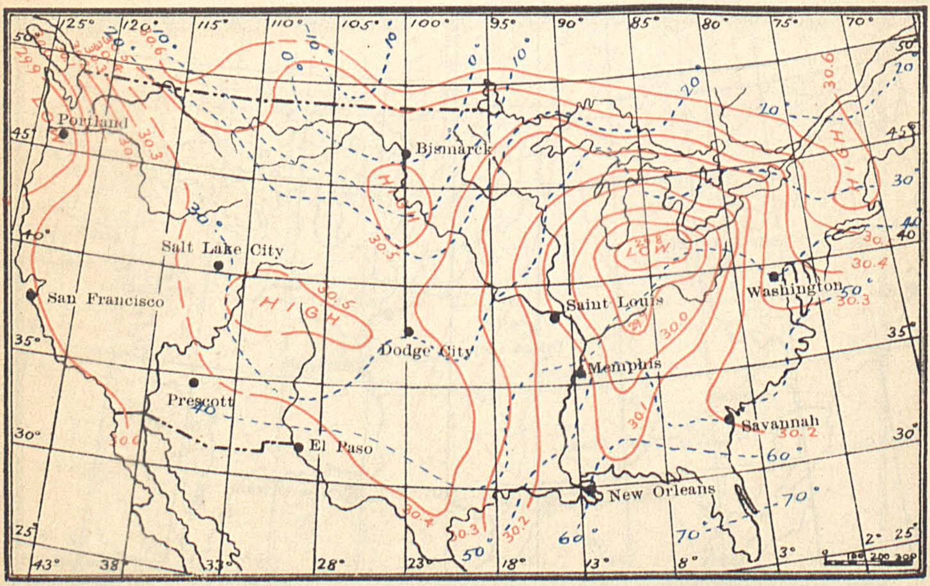
Salt Lake City
San Francisco
Saint Louis
Washington
Dodge City
Memphis
Prescott
Savannah
El Paso
New Orleans
LOW


Portland
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HIGH

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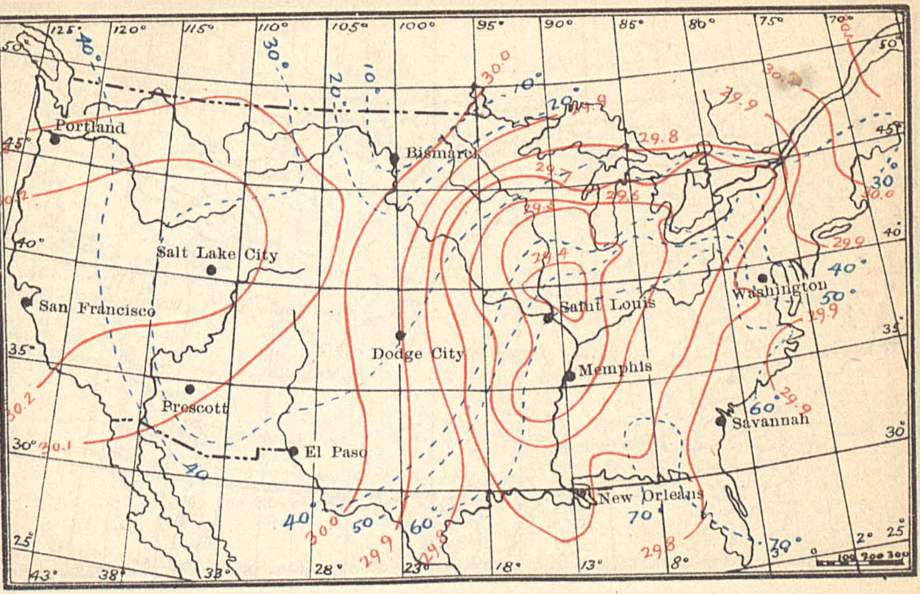

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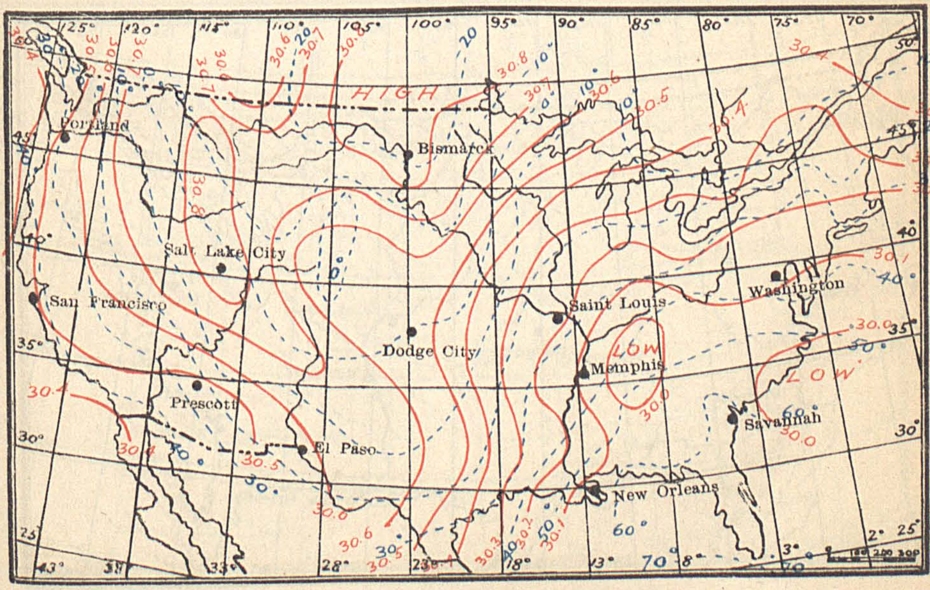

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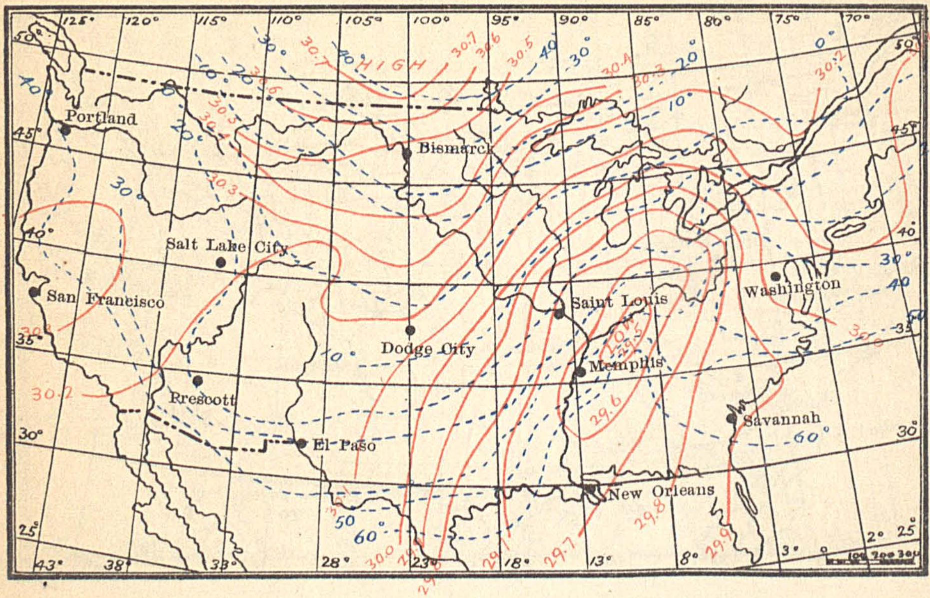

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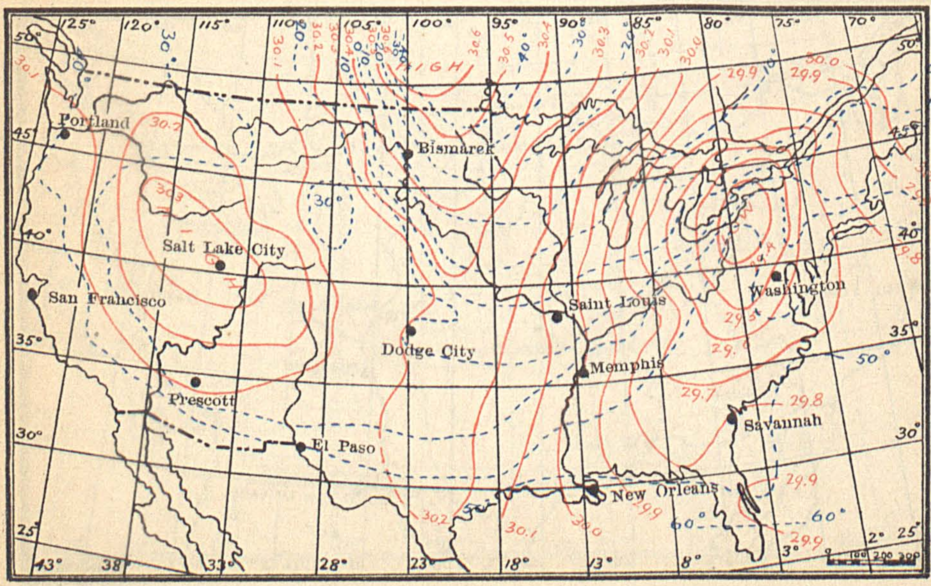

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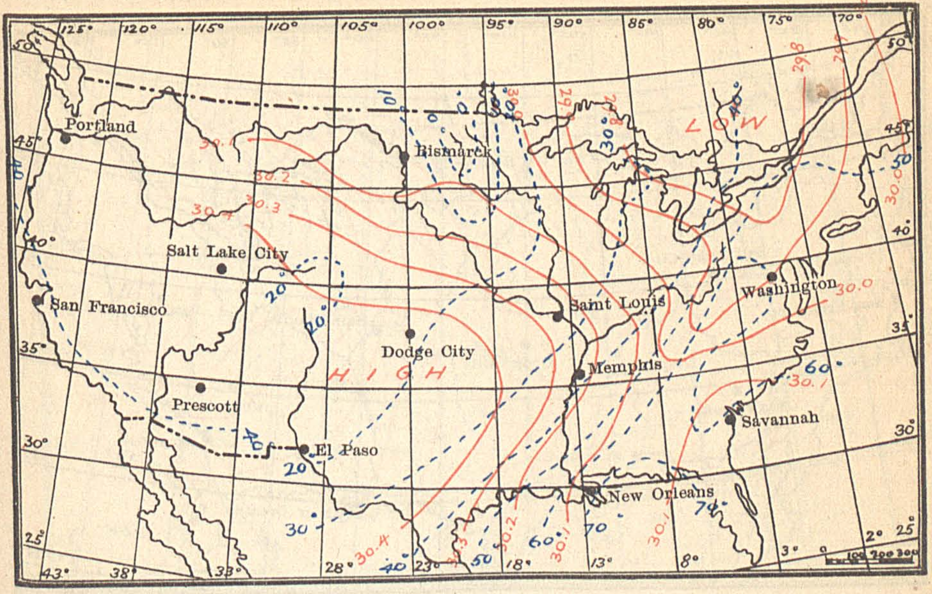

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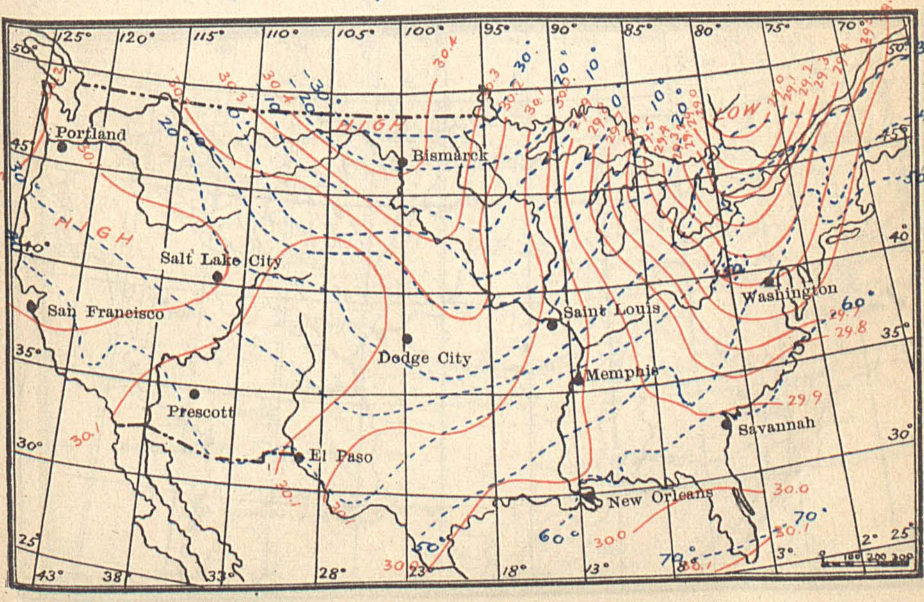

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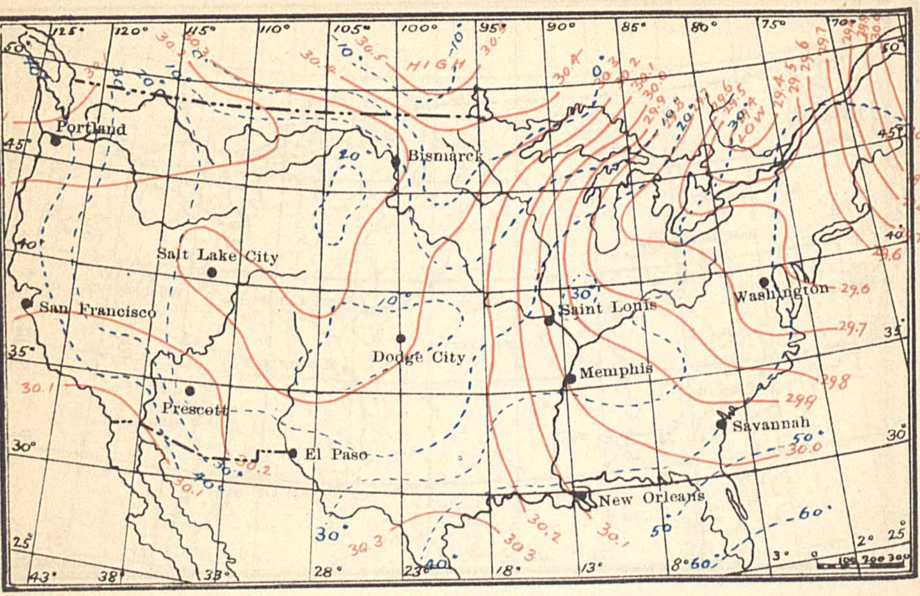

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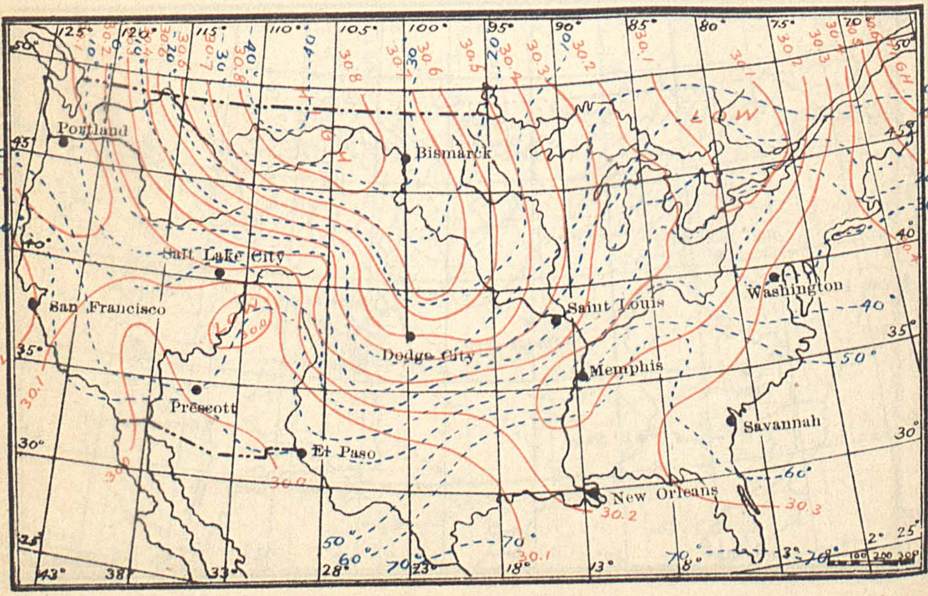

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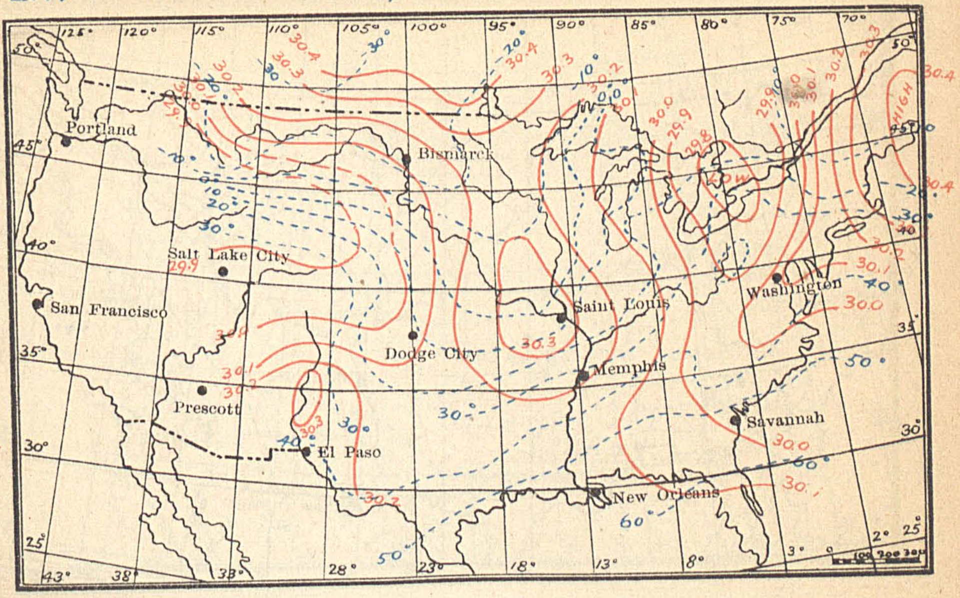

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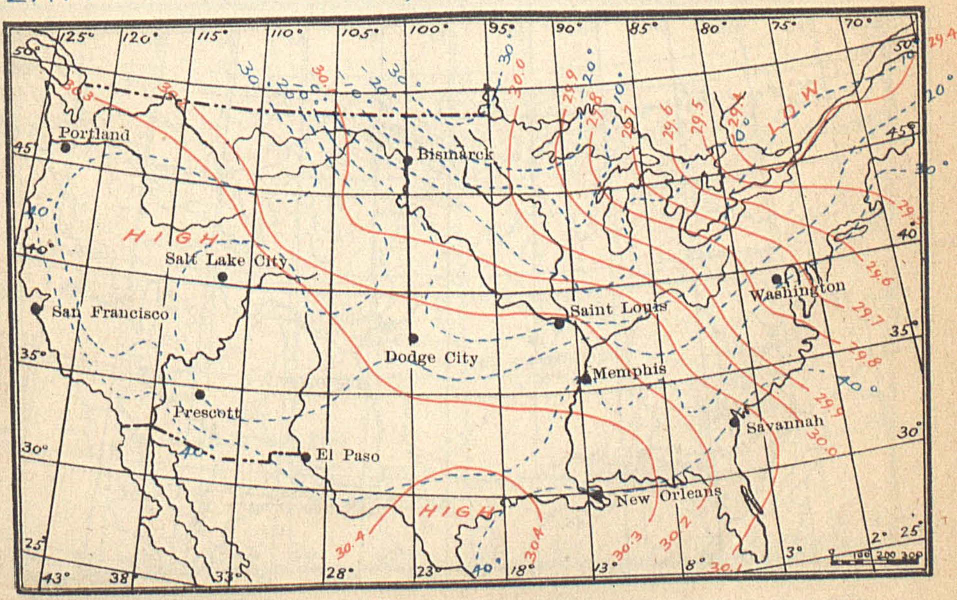

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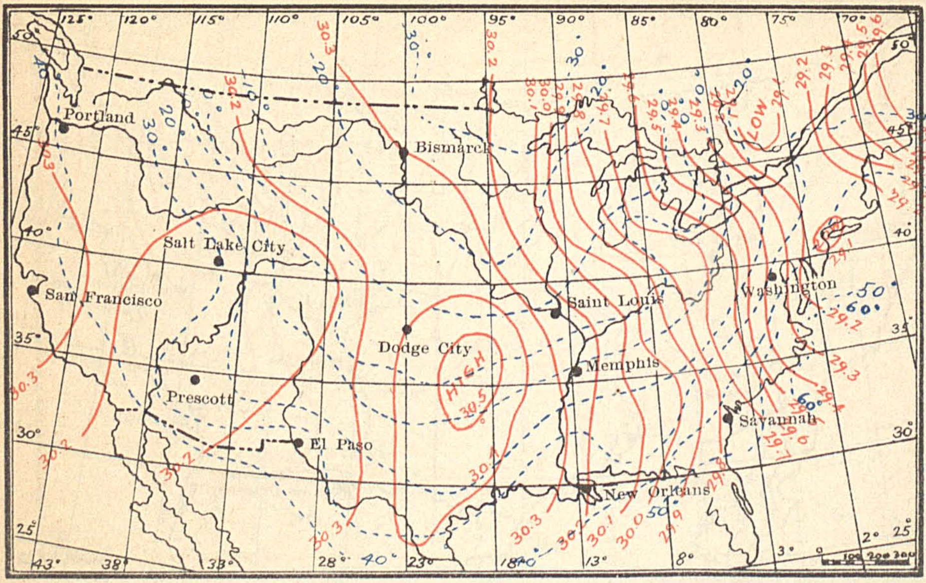

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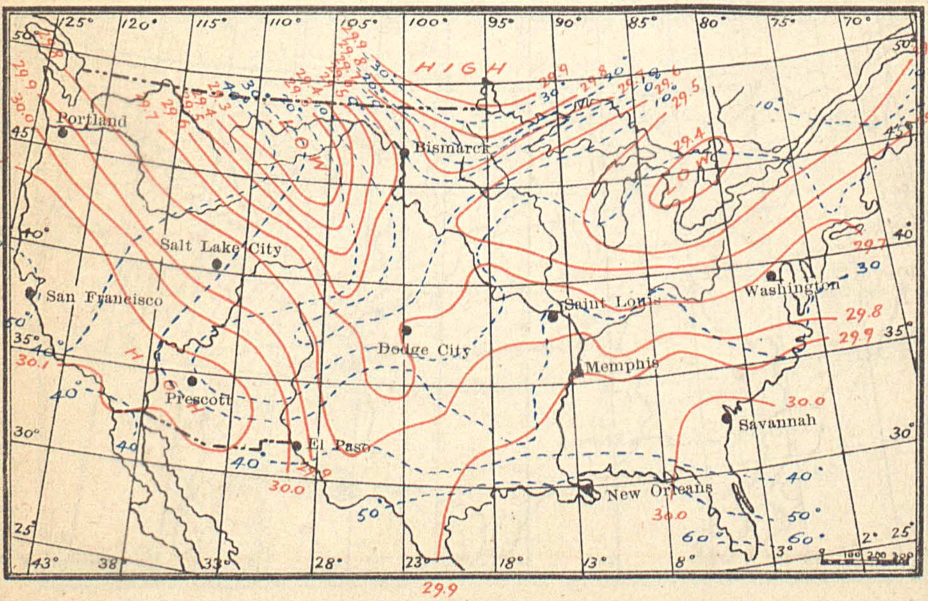

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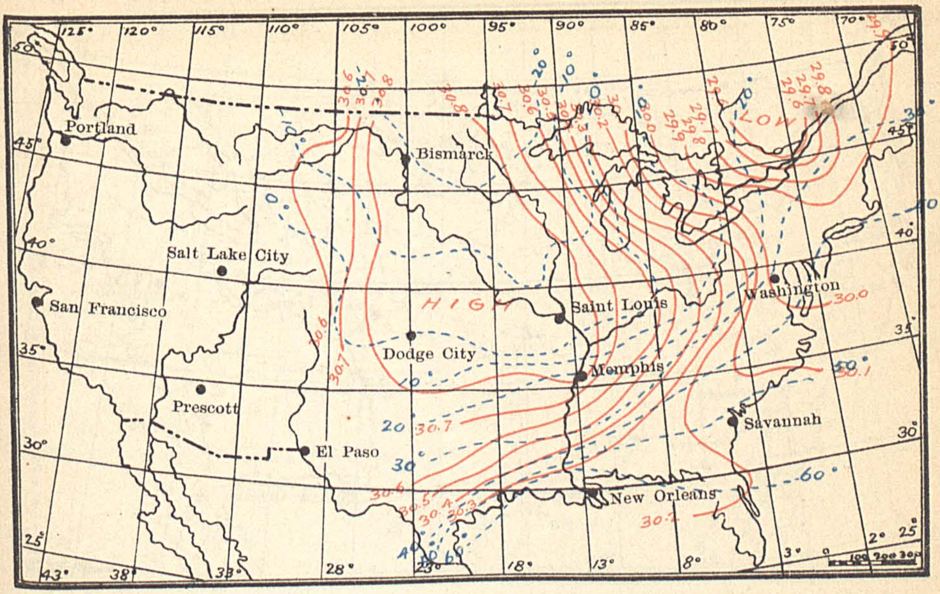

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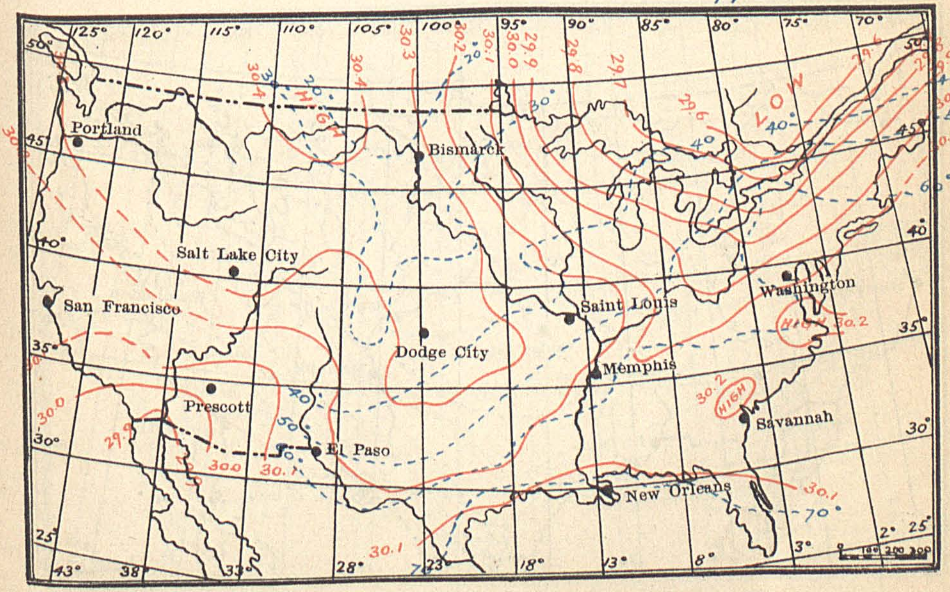
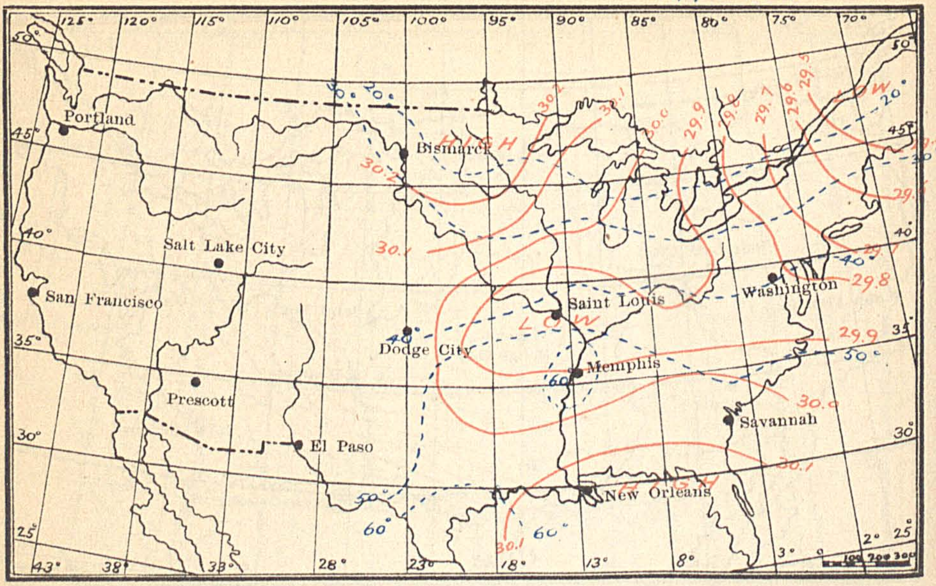


LXXI March 25ᵗʰ 1881. Appendix No. 5



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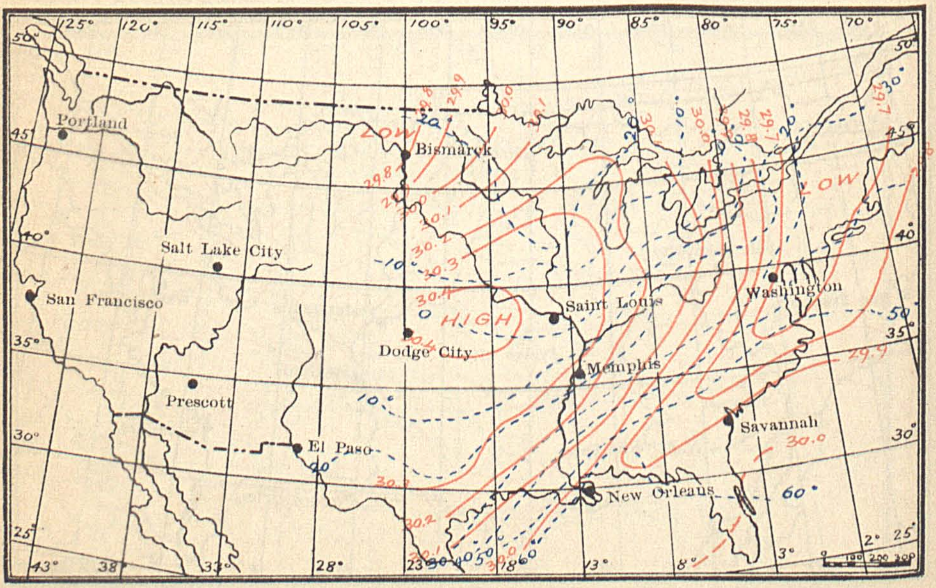

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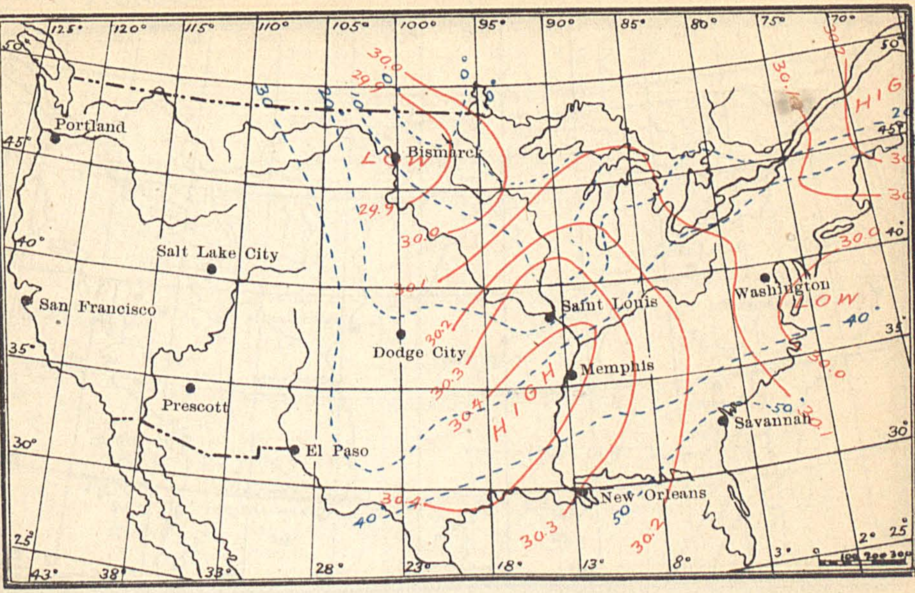

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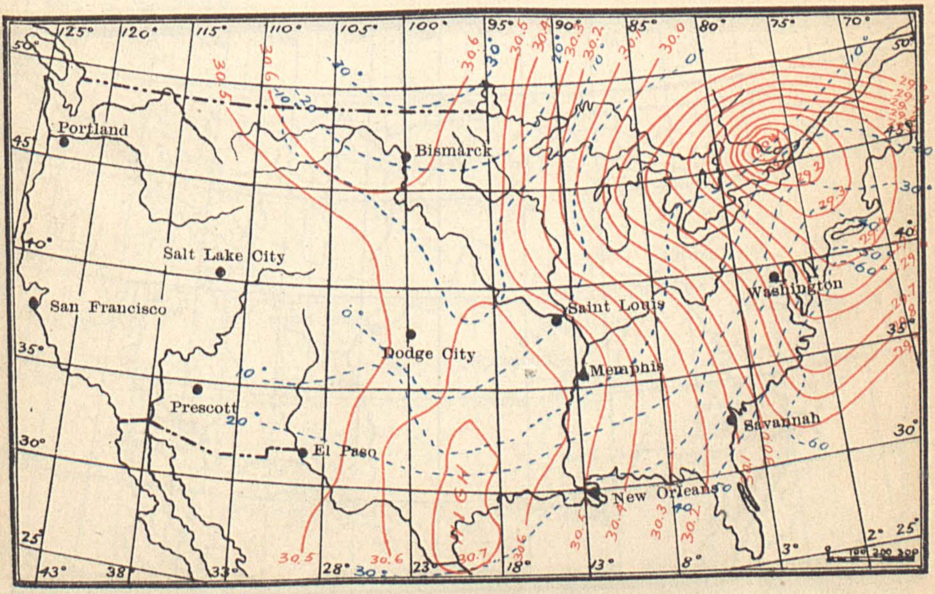

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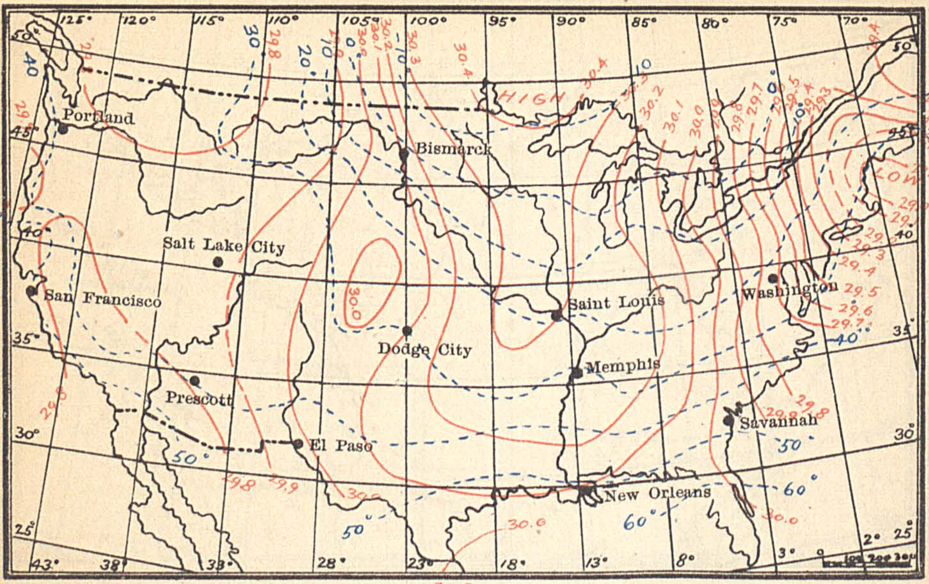

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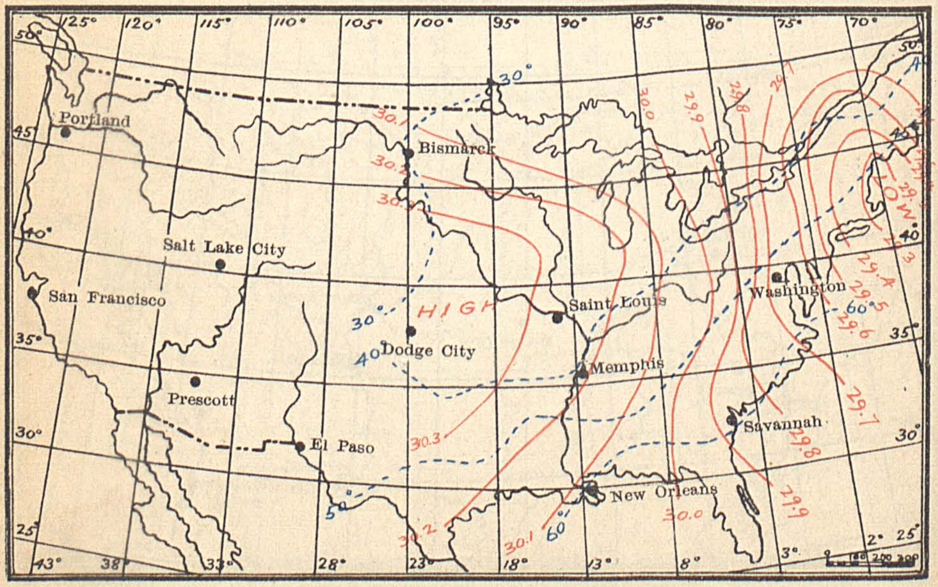

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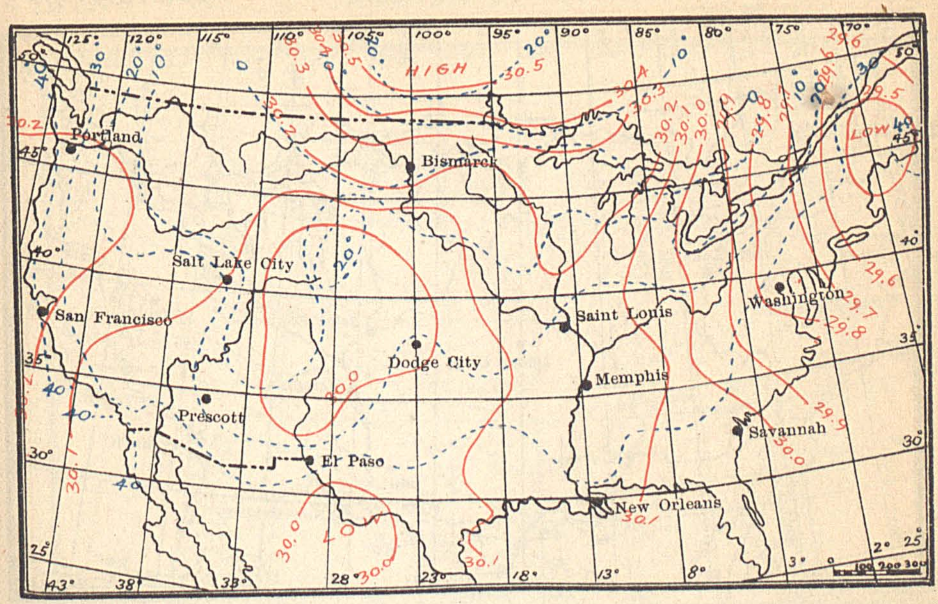

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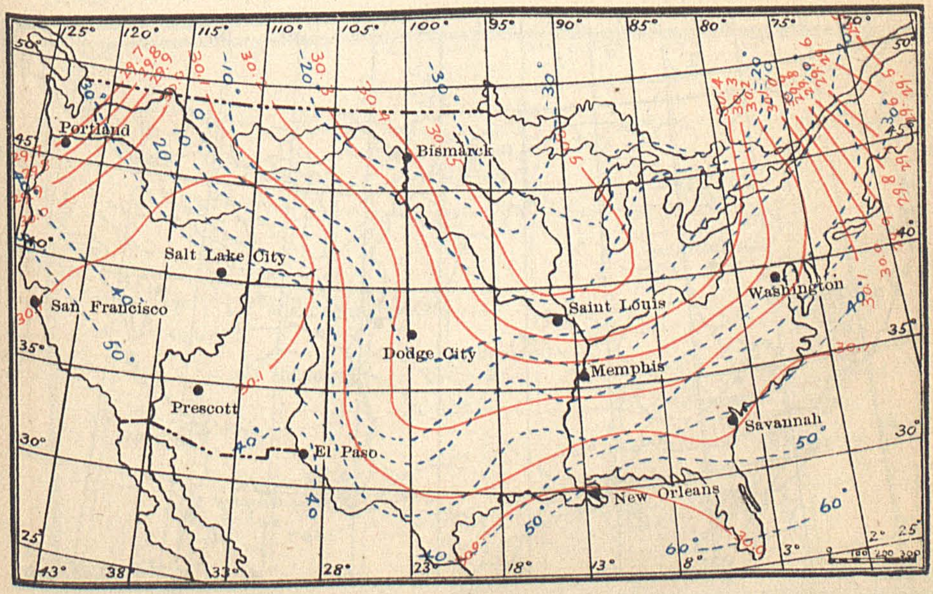

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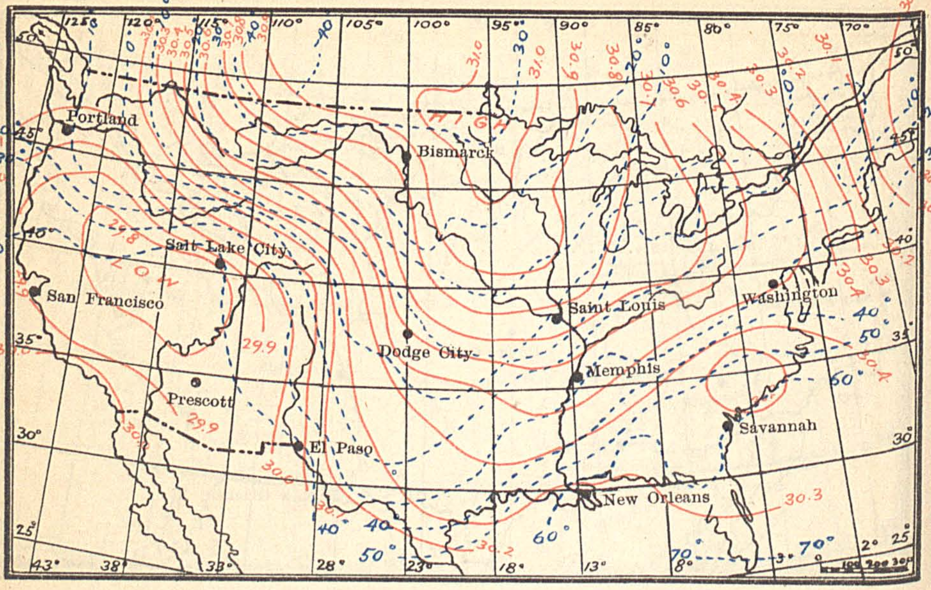

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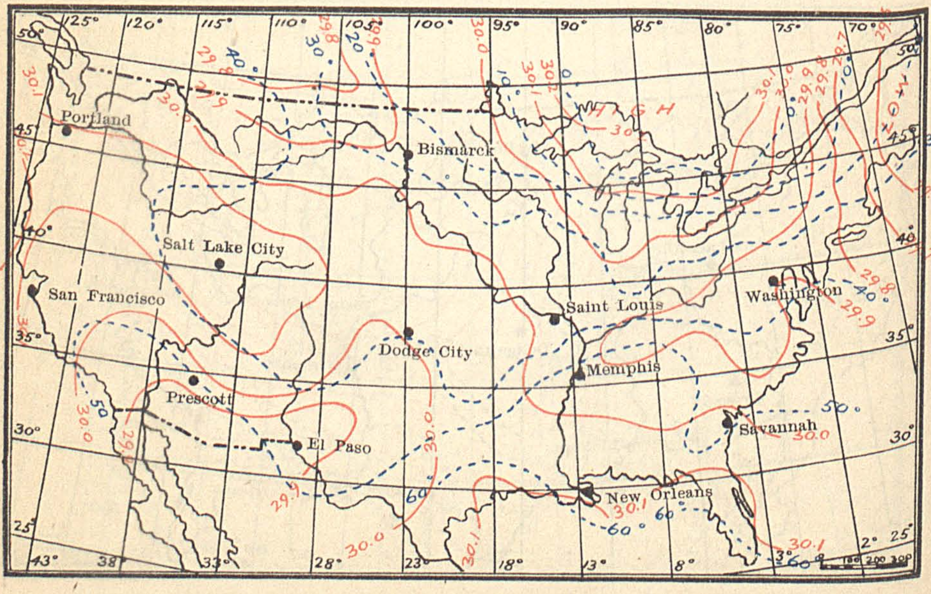

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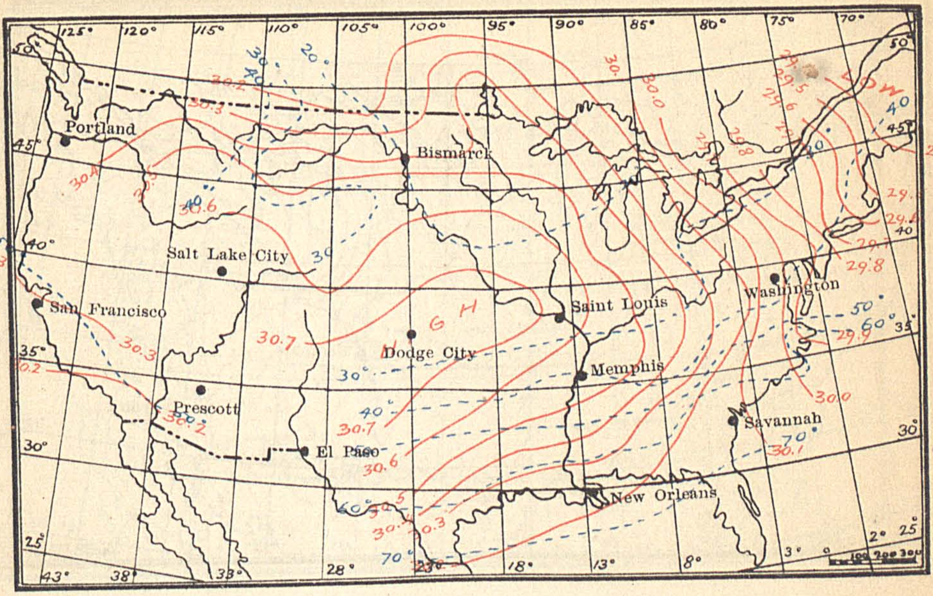

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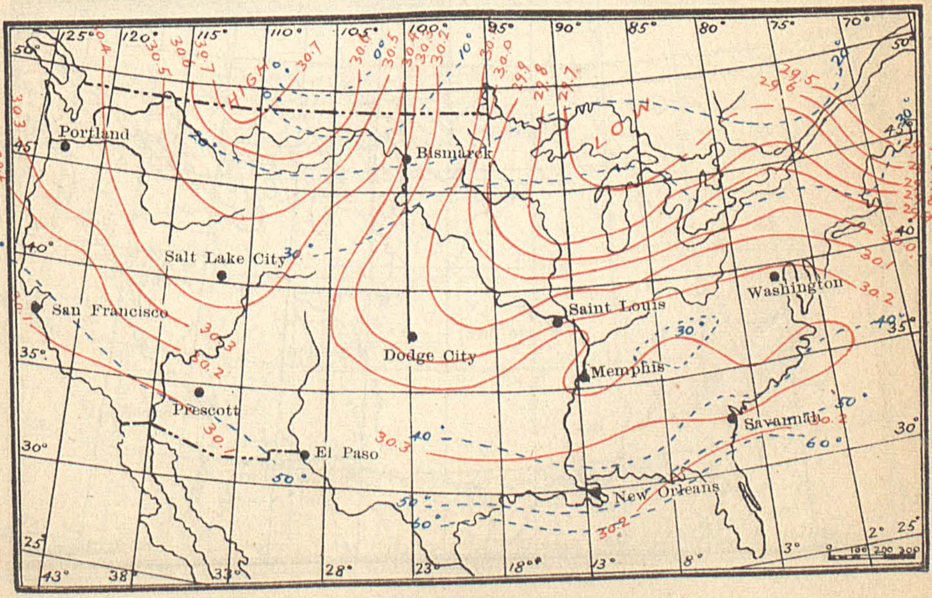

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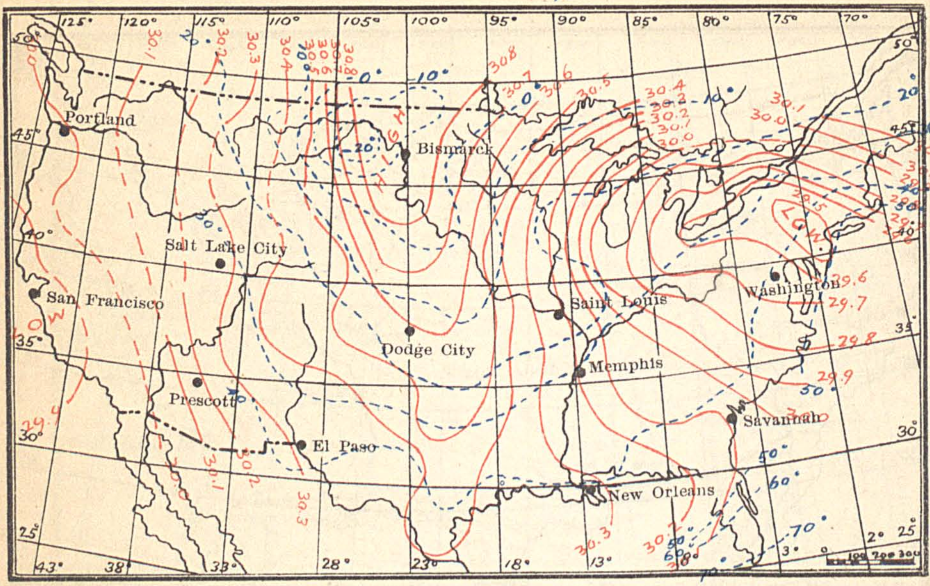

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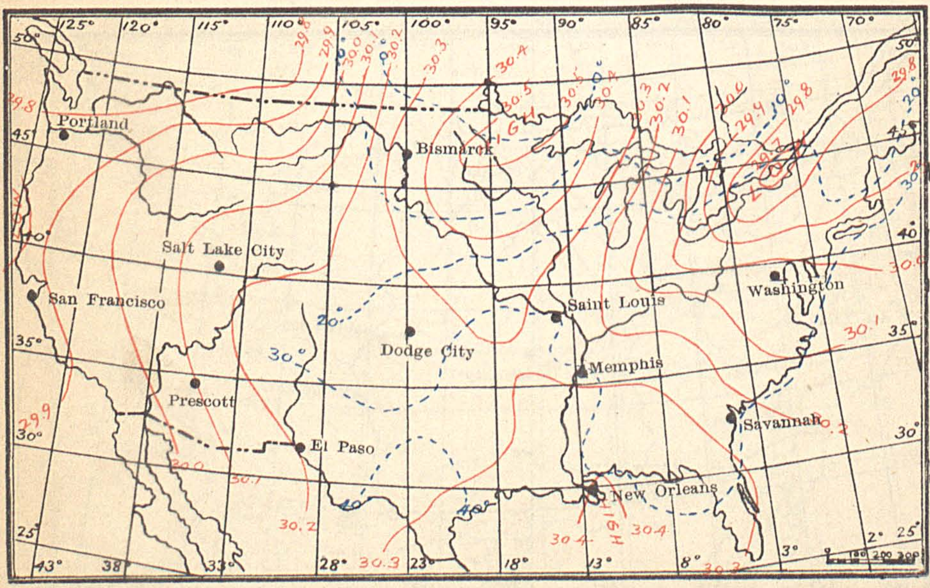

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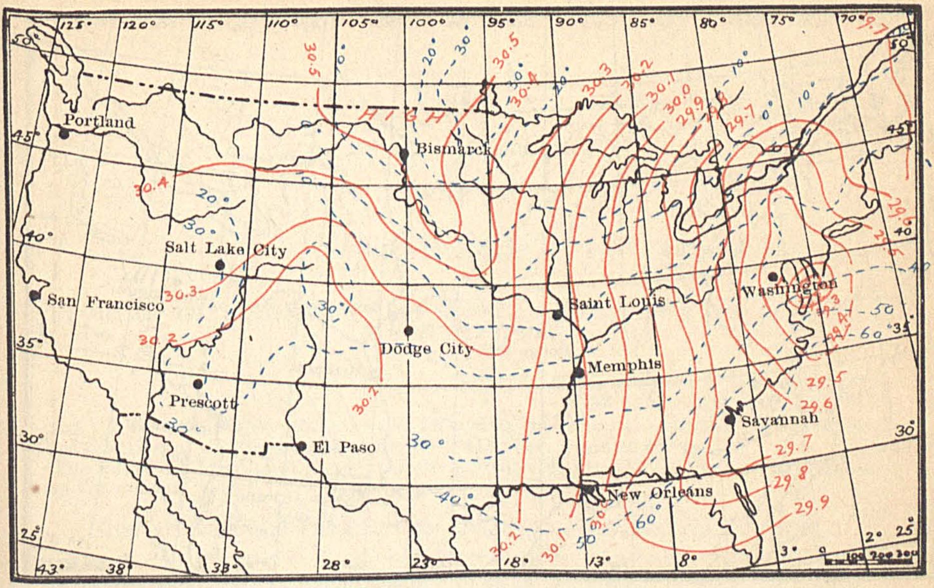

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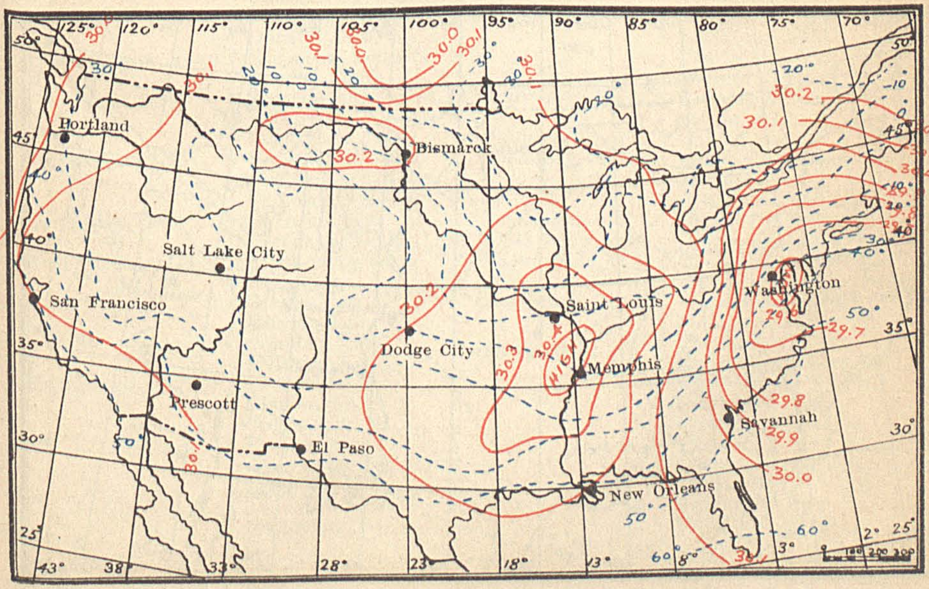

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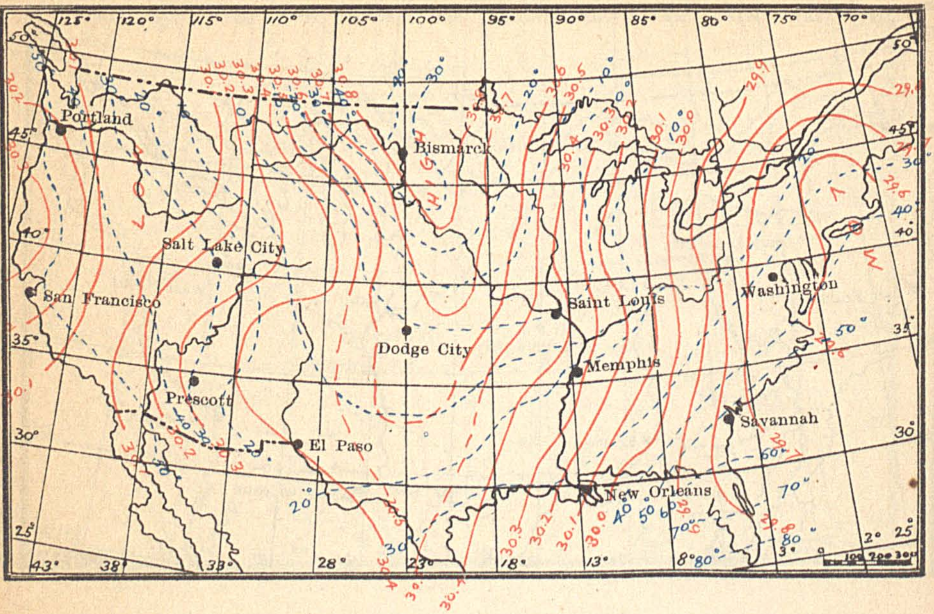

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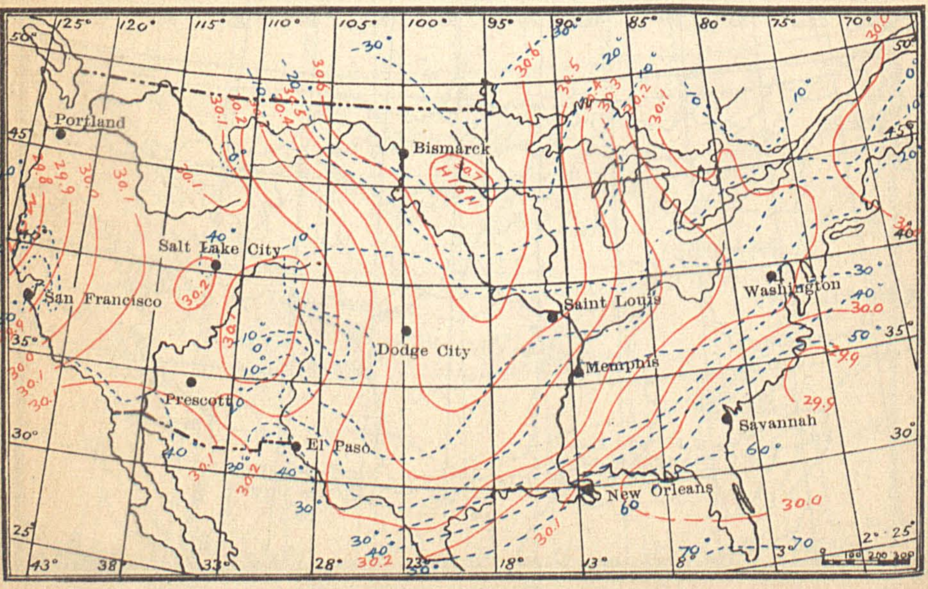


APPENDIX 6.

REPORT OF THE ASSISTANT PROFESSOR IN CHARGE OF THE RIVER AND FLOOD DIVISION.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, July 22, 1890.

SIR: I have the honor to make the following report on the work of the river and flood division of the Signal Office for the past year.

The following is a list of river stations and special rainfall stations to be in operation the coming year:

LIST OF SPECIAL RIVER STATIONS ARRANGED ACCORDING TO SECTIONS.

Head of section.	Name of station.	Head of section.	Name of station.
Cairo, Ill	Columbia, Tenn.	Pittsburgh, Pa ...	Morgantown, W. Va.
	Eddyville, Ky.		Oil City, Pa.
	Evansville, Ind.		Parker's Land'g, Pa.
	Grand Tower, Ill.		Rowlesburgh, W. Va.
	Terre Haute, Ind.		Saltsburgh, Pa.
	Mount Carmel, Ill.		Warren, Pa.
	Mount Vernon, Ind.		Weston, W. Va.
	Paducah, Ky.	St. Louis, Mo	Beardstown, Ill.
	Johnsonville, Tenn.		Boonville, Mo.
	Vincennes, Ind.		Hermann, Mo.
	Charleston, Tenn.		Jerome, Mo.
	Clinton, Tenn.		Le Claire, Iowa.
	Decatur, Ala.		Louisiana, Mo.
Chattanooga, Tenn.	Kingston, Tenn.		Peoria, Ill.
	Loudon, Tenn.		Warsaw, Ill.
	Strawberry Plains, Tenn.	Shreveport, La ...	Coushatta, La.
			Fulton, Ark.
	Rockwood, Tenn.	Memphis, Tenn ...	Helena, Ark.
Kansas City, Mo	Manhattan, Kans.	Vicksburg, Miss ..	Yazoo City, Miss.
	Plattsmouth, Nebr.		Newport, Ark.
	St. Joseph, Mo.		Arkansas City, Ark.
Nashville, Tenn	Burnside, Ky.	Charleston, S. C ..	Mount Holly, N. C.
	Carthage, Tenn.	Little Rock, Ark ..	Dardanelle, Ark.
New Orleans, La ...	Alexandria, La.	Washington, D. C.	Harper'sFerry, W. Va.
	Delhi, La.		Muscatine, Iowa.
	Girard, La.	Cincinnati, Ohio ..	Wheeling, W. Va.
	Monroe, La.		Marietta, Ohio.
	Camden, Ark.		Portsmouth, Ohio.
	Melville, La.		Zanesville, Ohio.
Pittsburgh, Pa	Brookville, Pa.		Pt. Pleasant, W. Va.
	Clarion, Pa.		Circleville, Ohio.
	Confluence, Pa.		Charleston, W. Va.
	Freeport, Pa.		Hinton, W. Va.
	Greensborough, Pa.		Catlettsburgh, Ky.
	Lock No. 4, Pa.		Louisa, Ky.
	Johnstown, Pa.		Falmouth, Ky.
	Mahoning, Pa.		Frankfort, Ky.

SPECIAL RAINFALL STATIONS—ONE OBSERVATION TAKEN DAILY.

Shreveport section—Arkadelphia, Ark.

Cairo section—Lafayette, Ind.; Logansport, Ind.; Greensburgh, Ky.; Bowling Green, Ky.

Chattanooga section—Rogersville, Tenn.; Murphy, N. C.; Asheville, N. C.; Charleston, N. C.

Cincinnati section—Kenton, Ohio; Mansfield, Ohio; Wooster, Ohio; Canton, Ohio; Abingdon, Va.; Caledonia, Ohio; Christiansburgh, Va.; White Sulphur Springs, W. Va.; Glenville, W. Va.; Buckhannon, W. Va.

Dubuque section—Portage, Wis.

Fort Smith section—Springer, N. Mex.; Eufaula, Ind. T.; Tulsa, Ind. T.

Montgomery section—Rome, Ga.

Keokuk section—Cedar Rapids, Iowa.

La Crosse section—Chippewa Falls, Wis.; Phillips, Wis.; Medford, Wis.

Kansas City section—Culbertson, Nebr.; Oberlin, Kans.; Kirwin, Kans.; Wallace, Kans.; Salina, Kans.

Louisville section—Rushville, Ind.; Huntington, Ind.; Sidney, Ohio.

Nashville section—Williamsburgh, Ky.

St. Louis section—Ottawa, Ill.

St. Paul section—Fergus Falls, Minn.; Fort Ripley, Minn.; Ortonville, Minn.; Alexandria, Minn.; Redwood Falls, Minn.; Tracy, Minn.

Washington section—Woodstock, Va.; Gettysburgh, Pa.; Cumberland, Md.

Telegraphic reports of the stage of the water are received daily at the Washington office from the following places: Shreveport, La.; Fort Smith and Little Rock, Ark.; Sioux City, Iowa; Omaha, Nebr.; Kansas City, Mo.; St. Paul, Minn.; La Crosse, Wis.; Dubuque, Iowa; Davenport, Iowa; Keokuk, Iowa; St. Louis, Mo.; Cairo, Ill.; Memphis, Tenn.; Helena, Ark.; Vicksburg, Miss.; New Orleans, La.; Pittsburgh, Pa.; Parkersburgh, W. Va.; Cincinnati, Ohio; Louisville, Ky.; Chattanooga and Nashville, Tenn.; and Augusta, Ga.

The only changes in the list from that of last year is the establishment of an additional river station on the Wabash River at Terre Haute, Ind., and special rainfall stations at Rome, Ga., and Arkadelphia, Ark.

The river-gauge readings at all the Signal Service stations since the commencement of observations have been arranged and copied, a single page containing the readings at a place for each year. Part of these, comprising all in the Ohio valley, except the readings for such stations as have already been published by the Mississippi River Commission, have been milliographed in typewriting. Forty-seven full copies were produced, each making a volume of 395 pages. The book is entitled "Stages of the Ohio River and its Principal Tributaries, 1858 to 1889, inclusive. Part I."

It is in contemplation to largely increase the number of river and rainfall stations this year if the increased appropriation of $13,000 asked for is granted. The appropriation last year for the river and flood service was $9,000. Six river stations might be advantageously established in Alabama at various points, and three in Georgia. Of those in Georgia, one should be at Rome, in the northern part of the State, and another at some point on the river above it The third station in Georgia should be at some point on the Savannah River above Augusta.

There is great demand on the part of river interests for additional stations on the upper tributaries of the Ohio River. At least two additional river stations might be established there; one should be at West Newton. About four special rainfall stations should be opened.

It would be expedient to establish two river stations on the Susquehanna River, one at Harrisburg, and another at some point above, and two on the Juniata River.

Some investigations were made during the year of the relation of gauge readings at various places during rising stages of the rivers, especially for Cairo.

This was done for the purpose of deriving some sort of a practical rule by means of which the approximate stages of water at Cairo might be computed some days in advance when there was an important rise. The river stations available for this purpose are St. Louis, Cincinnati, Chattanooga, and Nashville.

The area of country drained by the water passing Cincinnati is 78,000 square miles; that passing Nashville drains 15,000; that passing Chattanooga drains 33,000; that passing St. Louis drains 727,000 square miles. On the average, as shown by discharge measurements in 1881 and 1882, the quantity of water passing St. Louis, coming from the Missouri and Upper Mississippi Rivers, is about eight-tenths of the volume of water that comes out of the Ohio River, as shown by the discharge measurements at Paducah. Below St. Louis, Cincinnati, Chattanooga, and Nashville there is an area of 108,000 square miles, the water from which passes Cairo, but does not pass those places. Any rule derived for determining the Cairo stage of water from stages at points above which leaves out of account the rainfall in this area will be necessarily very imperfect. There is no satisfactory way of taking into account the rainfall in this area.

But inasmuch as predictions of the stages of water have to be made, it is necessary that some systematic method for the purpose be devised. Such general warnings as "the river will rise," or "the river will fall," or "the river will rise greatly," are manifestly not of much value to the public.

From a consideration of the time it takes flood water to travel to Cairo from the places mentioned, and from a consideration of the fact that when the stage of water at Cairo is high, a rise at a point above has less effect than when the Cairo stage is low, the following plan of deriving the rule was devised:

The principal rises that have occurred at Cairo since 1881, after there had been any considerable rise at Cincinnati, and the water at Cincinnati had reached a crest, were put equal to the rise at Cincinnati occurring six days before, plus the rise or minus the fall at Nashville occurring three days before, plus the rise or minus the fall occurring at Chattanooga six days before, and plus or minus the fall occurring at St. Louis four days before, each one multiplied by an unknown factor. The adopted relation between the rises at Cairo for different stages at that point was $0.30+\frac{(50-G)^2}{1900}$, G, being the gauge reading. Equations of observations were formed on this model for all the principal rises since 1881. The normal equations were formed and the values of the four unknown factors determined.

From this the rule was derived to find the rise at Cairo after six days, when there has been a rise of more than 10 feet at Cincinnati in six days preceding, and the water has reached or nearly reached its highest.

The rise at Cairo will be equal to 0.38 of the rise at Cincinnati in six days, plus 0.38 of the rise at Chattanooga in the preceding six days, plus 0.31 of the rise at Nashville in the preceding three days, plus 1.2 times the rise at St. Louis in the preceding four days, the whole sum multiplied by the factor $0.30+\frac{(50-G)^2}{1900}$. In case any of the stations have a fall instead of a rise it is to be taken with a minus sign.

In most cases this gives the rise within 2 or 3 feet.

There was a great flood in the lower Mississippi River during March and April. On March 1, when the stage of river at Cairo was 42.1 feet, the river at Cincinnati and other places having risen greatly, there was given a flood warning for the lower Mississippi Valley in a special bulletin from the Washington office. The rise to take place at Cairo in the next six days was given as 9 feet, computed according to the above rule, allowing an extra 2 feet for rainfall in the 108,000 square-mile area. The stage at Cairo on March 8 was 47.7, a rise of 6 feet, and after that, to March 12, it rose about 1 foot more.

The allowance of 2 feet for the rainfall in the 108,000 square-mile area was made on account of the rainfall being excessive as compared with the rainfall in same area preceding other floods.

Estimating river rise from depth of rainfall is decidedly uncertain, as has been found from experience in this case and in many others also.

In the same bulletin of March 1 it was estimated that the river at Vicksburg, which was 46.3, would rise by March 14 to 49 feet. On March 15 it had risen to 48, and probably would have gone higher had it not been for the crevasses that occurred about that time farther up the river.

On March 12 another flood warning was issued. It seemed evident at that time that the lower Mississippi was about to be visited by one of the greatest floods that had ever occurred. Other special bulletins were also issued on March 27 and April 2. These warnings were borne out in the main by the facts. The warnings were heeded and were a great benefit to the people in the country visited by the flood.

The damage done to the country was great. All the accounts from our observers agree that had it not been for the improved levee system the losses would have been enormous and the damage irreparable.

An investigation of the high waters of Cincinnati at various times was made, with a view to predicting rises in the future, from stages at points on the river above. This was not found practicable with any degree of satisfaction. The rainfalls are not of much service in predicting the river rise, no matter how numerous the stations. With a fall of 2 inches at several stations in the drainage area there is little or no rise at times; then, again, with a fall of only 1 inch at a single station the rise may be very great. Satisfactory methods of predicting stages of water for Cincinnati and other places might be devised if the relations between river discharges and gauge readings for points above were known.

As matters stand now there is no way of telling what a rise in the river at Zanesville, Circleville, or Louisa, etc., may mean. Similar gauge readings mean very different volumes of water passing at different places. The making of discharge measurements at a number of points would be an expensive matter, but there is no hope of improving the predictions of stages of water much until this is done. The gauging with self-registering revolving meters, which would be the most satisfactory method, could be done very economically by the Signal Service observers. With one competent engineer to go to a number of selected stations and instruct the observers, the observations could then be made by the observers at times when suitable stages of the river occurred. About four days' work at each stage of water about 10 feet apart throughout the range of river would give the discharge-curve with sufficient accuracy for prediction purposes.

The observers at the principal Signal Service stations are used to work of computation and their familiarity with anemometers and other self-registering apparatus renders it certain that with instruction they would be able to make satisfactory velocity measurements of the river current. The work would require only a few days from time to time, and help could be hired as needed for the time being. The observations might extend over three or more years, or long enough to get the widest range in the stages of water. It is estimated that the work might be done in this way at an expense of about $800 for each station. There are ten stations in the Ohio Valley where it would be advisable to have measurements of this kind made. An appropriation of about $3,000 a year for several years might be advantageously expended in gauging rivers according to this plan.

At a number of stations discharge measurements sufficiently good could be obtained by establishing temporary gauges at a distance of a few miles from places where there are gauges now and leveling accurately between their zeros. With an established cross-section and the slopes as derived from the gauge readings at different stages the velocities could be computed.

Floods in the Seine River, at Paris, France, are predicted three days in advance. The floods are of two kinds: those when the river at Paris is in a rising stage three days before the occurrence of highest water, and those when it is in a falling stage three days before. For the first kind the predicted stages at bridge "la Tournelle" are never more than 2 feet in error; for the second kind the error is at times somewhat greater. The rise at Paris is sometimes 26 feet above low water. The Seine above Paris drains about 20,000 square miles. The drainage area above Cincinnati is about four times as great. With a greater number of stations than there is now in the Ohio Valley above Cincinnati, and with a knowledge of the river outflow in relation to gauge reading, there is no reason why nearly as accurate predictions three days ahead could not be made for Cincinnati as for Paris.

Very respectfully,

T. RUSSELL,
In charge River and Flood Division

THE FLOOD IN THE LOWER MISSISSIPPI RIVER, 1890.

During the months of March, April, and May, 1890, the Lower Mississippi Valley below Cairo, Ill., was visited by one of the greatest and most disastrous floods ever known to that region. The flood compares in extent with the great overflows in the same district in the years 1858, 1874, and 1882. The stages of water in the Mississippi River in the part of its course just below Cairo were not generally as high as in the floods mentioned, but this was compensated for by the long continued stage of high water. Along the lower course of the river the stages of water were from 1.5 to 2 feet higher than the highest ever known before. Most of the levees along the river at the beginning of March were in excellent condition to withstand a flood. The extension and repairs to these bulwarks of the lower valley, recently made under the direction of the Mississippi River Commission, had made a complete line of defense on the east bank from the Gulf of Mexico to Memphis, Tenn., and on the west bank from the Gulf to the mouth of the Arkansas River. Part of this, however, was of such recent construction that it was not able to withstand a long continued contact of the water, and after holding out very well for a month or more, it gave way in numerous places, flooding the country extending for 40 miles back from the river in the States of Missouri, Arkansas, Mississippi, and Louisiana. A levee to withstand the water the best should be two or three years old. The damage in the country, though great, would have been incomparably greater had it not been for the recent extensions and improvements made in the levee system.

On January 2 the Ohio at Cairo, with a stage of 18.5, began to rise, and reached 44.5 feet by the 20th. It then fell to 33 on February 7, reached another crest of 41.7 on February 17, and fell again to 34 on February 24. It then began to rise, rapidly at first, and then slowly, until it reached a maximum of 48.8 on March 13. It then slowly fell to 46.5 on March 26, and again rose to 48.7 on April 26, and then fell rapidly from that point.

In 1874 the highest water was 47.4, April 26; in 1882 the highest was 51.9, February 26; and in 1884, 51.8, February 22.

At Helena, Ark., the river began to rise January 2, and advanced steadily until the height of 42.1 was reached on February 1. The river then fell off slightly and attained another crest of 41.9 on February 21. It then fell slightly and again rose to the unprecedented height of 47.72 feet on March 30.

The highest reached in 1874 was 45.8 on May 11, and in 1882, 47.2 on March 9. In 1884, March 6, it reached a height of 47.

At Vicksburg, with a stage of 19.3 on January 7, the water began to rise steadily and reached a height of 48 on March 16. From this point the water fell slowly to 46.3 feet until March 31. This fall was probably due to the crevasse of March 15 at Pecan Grove, just above Vicksburg. From this time the river rose gradually to 49.1 feet on April 25. This excessively high stage at Vicksburg was due to the crevasse water coming out of the Yazoo Basin added to the main river flood.

In 1874 the highest water was 45.7 May 2; in 1882, the highest was 48.8 March 21, and in 1884, 49 March 25.

At Red River Landing, La., the highest gauge reading, 48.6, was reached April 23. The highest in 1874 was 47, April 16; in 1882, 48.5 on March 27, and in 1884, March 29, 47.3.

At Natchez, Miss., the highest water, 48.6, was reached April 23. The highest in 1874 was 45.6, April 20; in 1882, 47.8 on March 28, and in 1884, 47.4 March 24.

At Baton Rouge, La., the highest gauge reading 36.6 was obtained April 21. The highest in 1874 was 36.2 April 16; in 1882, March 21, 35.9, and in 1884, March 24, 36.2.

At New Orleans the river with a stage of 6 feet began to rise January 8, and advanced steadily until a stage of 16.7 was reached on March 21. The water was about 16 feet until April 21, and remained above the danger line, or 13 feet, until June 13.

The river at New Orleans is subject to an oscillation of a few tenths of a foot, having a period of half an hour, supposed to be due to the impact of river on the bend at that place. At the crest of one of these oscillations the gauge read 17 on the afternoon of March 13. The greatest velocity of river in front of city at the time was 5.5 miles per hour.

In 1874 the highest water was 16 April 15; in 1882 the highest was 15 March 27, and in 1884, 15.6 March 18.

The stages of water that preceded the great rise this year were preceded at Cincinnati, Ohio, by flood-wave crests of 48.7 January 21, 48 February 10, 57 March 1, and 59 March 26. At Nashville there were crests of 36.5 January 22, 38 February 13, 50.7 March 6, and 41 March 28. At Chattanooga there were crests of 13 January 23, 42.5 March 2, and 27.3 March 25.

The Upper Mississippi above Cairo, at St. Louis, had maximum stages of 14.4 January 18, 11.5 February 8, 15 March 16, 17.5 April 5, and 18.5 April 30.

From the monthly mean gauge readings at St. Louis, Mo., and Paducah, Ky., for 1881 and 1882 given in the report of the Chief Signal Officer for 1889 on page 164, and the river discharges at the same places for the corresponding months given on pages 161 and 162, it is computed from the mean gauge readings for January, February, March, April, May, and June, 1890, that the following amounts of water in cubic miles passed St. Louis and Cairo which subsequently passed through the Mississippi River below Cairo. All the water of Ohio Valley passes Paducah, and all of the Upper Mississippi and Missouri passes St. Louis.

CUBIC MILES OF WATER PASSING ST. LOUIS AND PADUCAH.

1890.	St. Louis.	Paducah.
January	1.7	8.9
February	2.0	10.7
March	2.0	17.3
April	3.1	11.3
May	2.8	7.0
June	4.0	8.7

The Upper Mississippi contribution to the flood was comparatively small, as is usually the case in floods of the lower river, the main volume of water, as may be seen from the above, coming out of the Ohio and its tributaries, the Cumberland and Tennessee. The Missouri River cuts a very small figure in the flood, as only one-third of the water which passes St. Louis comes out of it.

The following shows the number of cubic miles of water poured into the Mississippi River below Cairo by the Upper Mississippi above St. Louis, and by the Ohio River above Paducah, for the six months, January 1 to July 1, during the flood years 1890 and 1882, and also during 1881, which was not a flood year in the Ohio, but was a year of great flood in the Missouri River.

CUBIC MILES OF WATER ENTERING LOWER MISSISSIPPI RIVER.

Year.	From the Upper Mississippi River.	From the Ohio River.
January to July—		
1881	34.2	35.7
1882	30.9	73.8
1890	15.6	58.9

There passes through the Lower Mississippi River, in addition to the above, the water from the Arkansas, the White, the Red, the St. Francis, the Yazoo, and other rivers.

While there was no flood in the Lower Mississippi in 1881, yet the water was quite high; at Cairo 45.8 April 20, at Vicksburg 41.6 May 10, at New Orleans 12.4 May 26. The total of water entering the lower river from above St. Louis and Cairo in the first half of 1881 being 69.9 cubic miles, and in 1890 for the same time being 74.5 cubic miles, or only a very little more than in 1881, shows that the water entering the river from the lower tributaries, the Arkansas, Red, etc., is very important in the flooding of the country.

During the flood of 1890 the water was above the danger line at Cairo 69 days; at Memphis, 56 days; at Helena, 113 days; at Vicksburg, 124 days; at New Orleans, 136 days. The danger line at Cairo is 40 feet; at Memphis, 33 feet; at Helena, 37 feet; at Vicksburg, 41 feet; at New Orleans, 13 feet.

In the flood of 1882 the river at Cairo was above the danger line 81 days; at Memphis, 65 days; at Helena, 115 days; at Vicksburg, 162 days; at New Orleans, 92 days.

For the month of January, 1890, the district of greatest rainfall, over 10 inches, was a strip of country 400 miles in length and 50 in width, extending from southeastern Missouri to Indianapolis, where the greatest fall occurred, 10.20 inches. The rainfall diminished to the northwest and southeast of this strip. The lines of equal depth of rainfall formed oblong areas, the longest axis extending from southwest to northeast.

In February the areas of equal depth of rainfall were the same shape as in January; the greatest fall was 10.95 inches at Nashville In March the areas were also the same shape and greatest fall 9.58 inches at Louisville.

The rainfall in cubic miles was as follows, during January, February, and March, in the catchment basin of the Ohio Valley, 211,680 square miles, and in the basin of the Upper Mississippi Valley above St. Louis, 171,800 square miles, excluding the Missouri Valley, as derived from planimeter measurements of the areas on maps:

Month.	1890.		1881.		1882.	
	Upper Mississippi Valley.	Ohio Valley.	Upper Mississippi Valley.	Ohio Valley.	Upper Mississippi Valley.	Ohio Valley.
January	6.2	19.0	3.2	11.4	2.6	26.9
February	4.8	24.1	8.7	16.0	4.9	21.7
March	5.0	19.9	5.5	12.0	7.3	16.7

The first important break in the levees occurred March 10 at Sappington Hook, on the west bank of the river, 6 miles above Arkansas City. The next was March 15 at Pecan Grove, on the west bank 33 miles above Vicksburg, and the same day near Luna Landing, Chicot County, Ark. All the plantations about Milliken's Bend and a large area of the Tensas Basin from below Lake Providence across to the Tensas River and Bayou Macon, and a great part of Chicot County were inundated by these breaks. This section of country, with Carrol Parish, La., is the greatest cotton-producing region of the world. The annual production is 175,000 bales, worth $9,000,000. The average yield is 400 pounds of best cotton to the acre. The Pecan Grove break rapidly widened to nearly a mile, and there was some loss of life and great loss of stock.

The first break on the east bank was on March 18, at Offutt's Landing, Bolivar County, Miss., 16 miles north of Greenville. Another break, due to the great storm of March 28, occurred at Easton, 12 miles above Offutt's Landing. This inundated the lower end of Bolivar County and the northern end of Washington County.

March 14 a break due to a defective rice-flume occurred at the Nita sugar plantation, St. James Parish, 62 miles above New Orleans and 3 miles above Convent. This was very disastrous to a number of fine sugar estates which produce annually 3,000 hogsheads of sugar and 20,000 barrels of rice. The water flowed through this break with a velocity of 7 miles an hour. On the 31st it was estimated it carried off one-thirteenth of the whole volume of the Mississippi River, thereby relieving the pressure on the levees below, causing a slight fall in the river at New Orleans. This particular break was a relief to the river below, as the water from it flowed into the Gulf through Lake Pontchartrain. Breaks at places further up the river, where the crevasse water is bound to return to the river lower down, are no relief except to the country in immediate vicinity of break, on the opposite bank of river, which is not flooded by the breaks. These breaks cause excessive stages of water lower down the river, which is very apt to go over the levees. As a rule the average stage of water will be less along the river the more the water stays within the levees. In the deep channel the water moves swiftly and the levees promote the rapid transfer of the flood-water to the Gulf.

The water coming out of the Yazoo Basin at Vicksburg from the breaks at Catfish Point, Austin, and Offutt's Landing caused great anxiety for the levees opposite. The disaster which would come with a further rise of the water, already within half a foot of the top of the levees, was provided for by placing along the tops of the levees a double row of bags filled with earth.

Laconia Circle was overflowed March 26. This is a circle of levees, 18 miles around, with cotton plantations on the inside. The destruction of property was complete. At places below the mouth of the White River the water rose 2 feet higher than ever before, and the White River country was flooded as it had never been flooded before. The Arkansas and other streams were in a state of extraordinary freshet, due to the unprecedented local rainfall.

The first break to occur in the Upper Yazoo Basin was on March 30, at Austin, Miss., 38 miles below Memphis. A number of fine cotton plantations in the vicinity of Austin and Tunica and in the northern part of Coahoma County were submerged. The annual production of cotton in this district is 20,000 bales.

On March 31 the protection levee in rear of Greenville, Miss., gave way and the town and vicinity was flooded, causing damage and distress, which was added to by the continuously falling rain.

The worst break on the east side of the river occurred at Catfish Point, 55 miles above Greenville, on April 4. A tremendous volume of water swept everything before it.

In Louisiana, from the Arkansas State line to the Gulf, the country on west side of river was flooded throughout an average width of 40 miles. The flooding on the north side of river extended from Martinez Crevasse, about 75 miles above New Orleans, down to the Gulf. The area flooded north of the river was about 1,500 square miles. The total of the flooded area in the State of Louisiana, as measured with a planimeter on the map herewith, is 11,000 square miles.

The following are all the crevasses that occurred. The first list gives those in Arkansas and Mississippi. Their location is shown on the map. The second list gives those in Louisiana.

CREVASSES IN STATES OF ARKANSAS AND MISSISSIPPI.

Eight miles above Arkansas City; levee broke March 9.

Sappington Hook, 6 miles above Arkansas City; levee broke March 10; 40 feet wide.

Mayersville, 66 miles above Vicksburg; levee broke March 13.

Luna, Ark., 30 miles below Arkansas City; broke 7 a. m. March 18; 400 feet wide.

Offutt's Landing, 16 miles north of Greenville, Miss.; levee broke March 18; became 600 feet wide. Gauge at Greenville read 43.45 on March 17; it fell 0.3 of a foot by the 20th.

One and five-tenths miles above Arkansas City; levee broke March 25; break 150 feet wide. Arkansas City gauge read 49.22 on 26th, and fell 0.4 of a foot in three days.

Skipwith, or Duncansby, Issaquena County, Miss., 69 miles above Vicksburg; levee broke at 1 a. m. March 26; 600 feet wide.

Laconia, 65 miles above Arkansas City; levee broke March 26.

Huntington, Miss.; levee broke March 28; 250 feet wide.

Columbia, Ark., 31 miles below Arkansas City; levee broke March 28; 300 feet wide.

Easton, Miss., 4 miles above Arkansas City; levee broke March 28; 300 feet wide.
Austin, Miss., 58 miles below Memphis; levee broke March 30.
Catfish Point, 55 miles above Greenville; levee broke April 4; 1,500 feet wide
Vidalia, Miss., half a mile below Natchez; levee broke April 22; 150 feet wide.

CREVASSES IN LOUISIANA ON THE MISSISSIPPI RIVER.

Pecan Grove, or Raleigh, East Carroll Parish, March 15; width, 4,400 feet; caused by sloughing.
Lake Concordia, Concordia Parish, April 22; width, 837 feet; depth, 13.35 feet; caused by sloughing.
Arnauldia, Concordia Parish, April 23; width, 455 feet; depth, 2.42 feet; caused by wave wash.
Henderson Ashley, Concordia Parish, April 23; width, 873 feet; depth, 7.77 feet; caused by water running over.
Raccourci, Pointe Coupee Parish, April 23; width, 380 feet; depth, 3.30 feet; caused by sloughing; closed May 28.
Upper Morganza, Pointe Coupee Parish, April 21; width, 790 feet; depth, 8 feet; caused by wave wash.
New Morganza, Pointe Coupee Parish, April 22; width, 2,543 feet; depth, 13.12 feet; caused by wave wash.
Snead, Pointe Coupee Parish, April 21; width, 147 feet; depth, 3.56 feet; caused by wave wash.
Lanaux, Pointe Coupee Parish, April 21; width, 151 feet; depth, 3 feet; caused by wave wash.
Fannie Riche, Pointe Coupee Parish, April 21; width, 845 feet; depth, 7.37 feet; caused by sloughing.
Preston, Pointe Coupee Parish, April 21; width, 213 feet; depth, 4.60 feet; caused by wave wash; closed May 17.
Taylor No. 1, Pointe Coupee Parish, April 20; width, 203 feet; depth, 3.40 feet; caused by wave wash; closed May 11.
Taylor No. 2, Pointe Coupee Parish, April 20; width, 51 feet; depth, 3.70 feet; caused by wave wash; closed May 11.
Point Manoir, West Baton Rouge Parish, April 30; width, 571 feet; depth, 2.8 feet; caused by leak; closed May 17.
Lobdell, West Baton Rouge Parish, April 22; width, 1,981 feet; depth, 7.22 feet; caused by sloughing.
Martinez, East Baton Rouge Parish, April 22; width, 124 feet; depth, 19.70 feet; caused by rice flume; closed April 28.
Nita, St. James Parish, March 14; width, 2,892 feet; depth, 15 feet; caused by rice flume.
Live Oak, Plaquemines Parish, March 20; width, 116 feet; depth, 6.50 feet; caused by leak; closed April 10.
Myrtle Grove No. 1, Plaquemines Parish, March 21; width, 540 feet; depth, 5.5 feet; caused by wave wash and sloughing.
Myrtle Grove No. 2, Plaquemines Parish, March 21; width, 295 feet; depth, 3.5 feet; caused by leak.
Average of ten breaks at St. Sophie, Plaquemines Parish, February, March, and April; width, 45 feet; depth, 7 feet; caused by wave wash and leaks; all closed within six days after crevasses occurred.
Average of three breaks at Harlem, Plaquemines Parish, May; width, 25 feet; caused by rice flume and crawfish; all closed not later than one day after break.
Riceland, Plaquemines Parish, April 19; width, 60 feet; caused by wave wash; closed April 25.

CREVASSES IN LOUISIANA ON THE ATCHAFALAYA.

Ferguson's, Pointe Coupee Parish, April 22; width, 133 feet; depth, 6 feet; caused by crawfish.
Barbres, Pointe Coupee Parish, April 21; width, 212 feet; depth, 8.50 feet; caused by crawfish.
Harmanson, Avoyelles Parish, April 8; width, 300 feet; caused by sloughing.
Norwood, Avoyelles Parish, April 8; width, 150 feet; caused by crawfish.
Yellow Bayou Dike, Avoyelles Parish, April 8; width, 200 feet; caused by wave wash.
Mrs. Cason's, Avoyelles Parish, April 15; width, 300 feet; caused by wave wash.
Gordon's, St. Landry Parish, April 18; width, 400 feet; caused by wave wash.
Benton's, St. Landry Parish, April 22; width, 1,500 feet; caused by wave wash.
Churchville, St. Landry Parish, April 22; width, 500 feet; caused by wave wash.
Bayou Maringouin, Pointe Coupee Parish, April 15; width, 550 feet; caused by leak under levee.

CREVASSES IN LOUISIANA ON BAYOU LA FOURCHE.

Pattenville, Assumption Parish, March 4; width, 100 feet; caused by rice flume; closed March 21.
Leftwich, Assumption Parish, February 22; width, 80 feet; caused by a weak levee; closed March 8.
St. Mary-Panola, La Fourche Parish, March 8; width 150 feet; caused by crawfish.

CREVASSES IN LOUISIANA ON THE RED RIVER.

Pandora, Bossier Parish, May 7; width, 5,000 feet; caused by wave wash.
Upper Chalk Levee, Bossier Parish, May 7; width, 300 feet; caused by wave wash.
Sunflower, Bossier Parish, May 7; width, 1,800 feet; caused by wave wash.
Levy, Caddo Parish, May 7; width, 150 feet; caused by caving in of bank.
Staten Point, Caddo Parish, May 7; width, 2,000 feet; caused by wave wash.
Bayou Rapides, Rapides Parish, May 17; caused by culvert.
Grand Bend, Rapides Parish, May 18; width, 200 feet; caused by muskrats.
Stafford's, Rapides Parish; width, 300 feet; caused by wave wash.
Echo Landing, Avoyelles Parish; width, 300 feet; caused by wave wash.

"In Plaquemines Parish there were three breaks at Corinne, averaging about 25 feet in width, one at Bertrandville 15 feet wide, one at Woodland 10 feet wide, two at Thibaut's averaging 12 feet wide, two at Empire Mills averaging 15 feet, three at Bohemia averaging 20 feet, and one at New Texas Landing 30 feet wide.

"These crevasses were the result of small and weak levees, badly cut by crawfish, and in some instances of wave wash. They were minor affairs, however, and were all closed almost as soon as they occurred, none of them running longer than one day.

Bayou des Glaizes.—Between the mouth of this bayou, at Simmsport, on the Atchafalaya River, and Hamburg there were no less than thirty-two crevasses. The line of levee here is indifferent and received but little enlargement during the flood. The crevasses were of various lengths and of very slight depths, many of them not more than 0.4 of a foot deep. At certain points the bank of the bayou is high and there are no levees. By reason of the deep bends in the bayou and the water flowing across the points about as many of the crevasses were inlets to the bayou as were outlets.

"The Times-Democrat furnished its readers on September 1, 1890, in addition to the above list of crevasses, with an accurate map, compiled from the United States surveys. On the map is indicated the overflow in Louisiana in 1890 and the position of the crevasses given above.

"The map commences at the Arkansas State line and extends to the Gulf of Mexico. It also extends west of the Mississippi River as far as the hill parishes or the termination of the alluvial country. A portion of Upper Red River bordered by a narrow belt of alluvial or bottom lands is not shown for want of space. Where the overflow existed the limits of the water are shown by shading or parallel lines. It must be borne in mind that the small scale on which the map is drawn precludes the possibility of showing some particular but small ridge or section of country as not overflowed that stood a foot or so above the water. Many such spots or places existed in the heart of an overflowed section, and yet it must not be concluded that the shading was put on abreast of the canvas or in such position as it would be safe to assume there was overflow. A small sketch of each parish was sent to the president of the police jury of the respective parishes in the overflowed country with the request to note thereon the overflow, which was done and the matter returned. Captain Kingman endeavored to collect a complete history of the flood and sent a man through the overflowed district determining the limits of the water.

"It is from such data and also that collected from interested persons living in many localities that the map is compiled. It was carefully arranged, and no more accurate map could be made unless many thousands of dollars were expended in the collection of actual survey data.

"All of the important crevasses that occurred on the Mississippi River are properly located and prominently registered on the map. Those that occurred on Red River, Bayou des Glaizes, Atchafalaya River, and Bayou La Fourche, with few exceptions, were small (dimensions stated above), and not put down on the map.

"It must be remembered that the large crevasses in Arkansas filled some of the basins or water courses so full as to cause them to overflow, which accounts for the large amount of water at the Arkansas-Louisiana State line.

"A glance at the map and a moment's review of the tabulated statements of crevasses will show from what source a parish or locality derived its overflow waters.

"When it is considered that this flood lasted many weeks, was the highest ever known, was as much as 2 feet higher than the flood of 1882 at many points on the river, and the small loss of levee is considered, it presents a most favorable argument for the levee system, and the showing is more than creditable to our then present line of levees. For mile after mile, covering a distance of more than 450 miles on the west bank and more than 175 miles on the east bank, the water was withheld by a line of sacks filled with earth and dirt, the one or the other or both, distributed in the form of a narrow little ridge along the crown of the levee. This had to be maintained night and day and during all kinds of weather. In spite of all this, out of a total distance of more than 650 miles of levee on the Mississippi River, only 3.73 miles of levee were washed away.

"On the other streams the levee systems, if such they can be called, are so imperfect that but little note can be made of the 2.41 miles of levee destroyed on the Red River and 2.46 miles of combined loss on the Bayou des Glaizes, Atchafalaya River, and Bayou LaFourche. On these streams at many points, as is shown in the statement of crevasses, the levees, where there were levees, were of insufficient height and received but little enlargement to oppose the rising flood. The water ran over them in many places only a few inches deep. The distance where the water so ran over is included in the mileage of crevasses or levee destroyed."

Nothing as yet is definitely known as to the areas of country flooded in the St. Francis and Yazoo Basins. In the former possibly 3,000 square miles was covered with water, and in the latter probably almost the whole of the area of the basin in the State of Mississippi, which is 6,648 square miles. Of the Tensas Basin, about 480 square miles in the Sate of Arkansas was covered with water.

When it became evident, from the great rainfalls and high stages of water in the upper rivers, that a flood in the Lower Mississippi River was impending, the following special *bulletin* was issued March 1 from the Washington City Signal Office, which was in the main borne out by the subsequent stages of water. The predicted stage a week in advance for Cairo was 51.5 feet, and it reached 48.8 on March 12. On March 1 a stage of water of 49 feet was predicted for March 14 at Vicksburg. On March 15 it reached 48, and probably would have gone higher had it not been for the break in the levee that occurred about that time.

SPECIAL RIVER BULLETIN.

WASHINGTON, D. C., *March* 1, 1890.

Observers Cairo, Memphis, Vicksburg, and New Orleans, give the following to local press and notify river men:

It is estimated that the Ohio River at Cairo will rise 9 feet between the present date, March 1 and March 7, making the stage of the water on the latter date at that place about 51.5 feet. The stage of water at Cairo to-day is 42.2 feet, and has risen 8 feet in the past five days.

This stage of water, if it occurs, as seems highly probable, will nearly equal some of the highest stages of water that have ever occurred at Cairo, namely, the stage of 51.9 feet on February 26, 1882; 52.2 feet February 27, 1883; 51.8 feet February 22, 1884.

This forecast is based on the recent great rises in the rivers of the Ohio Valley. At Cincinnati the stage of water, which is at its highest to-day, is 57 feet, and has risen 15 feet in the last five days. At Chattanooga the stage of water is 40 feet, and has risen 30 feet in five days. At Nashville the stage of water is 47 feet, and has risen 34 feet in six days. At Nashville and Chattanooga there may be some slight rises still to come. The stage of water at St. Louis is 8.5 feet, and has been stationary.

The high water of February 28, 1882, at Cairo was preceded by a 59-foot stage at Cincinnati on February 21, a 15-foot stage at Chattanooga, 38 feet at Nashville, and 28 feet at St. Louis. At the latter place there was a rise of 17 feet in the few days previous.

The high water of February 27, 1883, at Cairo was preceded by a 66-foot stage at Cincinnati on February 15, 13 feet at Chattanooga, 41 feet at Nashville, and 10 feet at St. Louis, the latter place having a rise of 5 feet the few days previous.

The high water of February 22, 1884, at Cairo was preceded by a 71-foot stage at Cincinnati on February 14, 31 feet at Chattanooga, 46 feet at Nashville, and 14 feet at St. Louis.

There is an area of country of 108,000 square miles, the drainage water from which passes Cairo, but does not pass St. Louis, Cincinnati, Nashville, or Chattanooga.

The empirical rule by which the rise of 9 feet at Cairo is computed is based on the principal rises that have occurred in the past seventeen years. This rule is not apt to be in error more than two feet, depending on the greater or less rainfall in the 108,000-square-mile area.

The water going by Cincinnati drains from an area of 78,000 square miles. The excessively high stages of water at Cincinnati in 1883 and 1884 are more than compensated for this year by the greater rainfall in the country below Cincinnati. The rainfall the past week in area above Cincinnati, Nashville, and Chattanooga has been about 5 cubic miles. For the whole Ohio Valley it has been nearly 11 cubic miles In 1882, for the whole month of February, it was about 22 cubic miles for the whole Ohio Valley.

In the Vicksburg drainage area below Cairo and Little Rock, equal to 71,000 square miles, there has been a rainfall of 3.5 cubic miles the past week.

The rainfalls from 8 a. m. February 22 to 8. a. m. March 1, occurring principally from the 24th to the 27th, have been 6 inches at Knoxville, 4.4 at Chattanooga, 5.2 at Nashville, 4.0 at Memphis, 4.3 at Cairo, 3.4 at Columbus, 3.3 at Indianapolis, 2.9 at Louisville, 2.7 at Little Rock, 2.0 at Vicksburg.

At Vicksburg the stage of the river to-day is 46.3 feet and at Little Rock 19 feet. For a 52-foot stage at Cairo February 28, 1882, and 25 feet at Little Rock, the subsequent highest water at Vicksburg, March 20, was 48.8 feet.

For a 52-foot stage at Cairo February 22, 1884, and 22 feet at Little Rock, the subsequent highest water at Vicksburg, March 25, was 49 feet. It seems likely, therefore, that by March 14 the river at Vicksburg will rise to a height of 49 feet unless by that time a great deal of water has run into the St. Francis and Yazoo bottoms.

These predictions are subject to some uncertainty on account of any rainfall that may occur before March 7. Any further rainfall will tend to make the water higher. It is not likely, however, that there will be any considerable rainfall soon, as the temperature throughout the country is very low and apt to remain so for several days.

Lack of rainfall and river stations renders more accurate forecasts impossible.

GREELY.

The number of lives lost, according to the reports received from Signal Service river observers, was thirty, all colored people.

The damage caused by the flood it is impossible to even roughly estimate.

On March 12 and April 2 other special bulletins, as follows, were issued:

SPECIAL RIVER BULLETIN.

WASHINGTON, D. C., *March* 12, 1890.

Observers Cairo, Memphis, Vicksburg, and New Orleans give the following to local press, and notify river men:

The stage of river at Cairo to-day, March 12, is 48.8 feet. The water has risen half a foot in the past twenty-four hours and one foot in the last four days. The conditions are favorable for a further rise. Within the next five days the river will approximate the highest known water, 52.2 feet.

At Cincinnati, in the twenty-four hours past, there has been a rise of 7 feet; at St. Louis, 1 foot. There has been a fall of 8 feet at Chattanooga, and 1 foot at Nashville.

The rainfall in the past four days has been 3.2 inches at Louisville and Fort Smith, 2.4 at Indianapolis and Cairo, about 1.5 at Little Rock, Memphis, Vicksburg, Shreveport, Cincinnati, and Columbus, and 1 inch at St. Louis and Nashville.

The quantity of rain that has fallen in the drainage area of the Ohio River in the past four days is estimated to be 4.5 cubic miles. Three cubic miles of this has fallen in the area below Cincinnati, Chattanooga, and Nashville.

At Vicksburg the stage of river is 47.4 feet. It has risen 0.4 of a foot in the past twenty-four hours. It will probably rise to 49 feet. There has been an extensive break in the main levee at Alsatia, 39 miles above Vicksburg, on the west bank of the river.

The Arkansas at Little Rock has risen 6.5 feet in the past twenty-four hours.

The rainfall in the Vicksburg drainage area below Cairo in the past four days has been 2 cubic miles.

The present prospects are that the stage of the river from Cairo to Vicksburg and below will be one of the highest known. Without desiring to create general alarm in the valley of the Lower Mississippi, yet it would seem that the coming stage of water warrants the advisability of timely removal of stock and such other property as would be destroyed by an extreme flood.

Owing to the lack of a larger number of rainfall stations from which to accurately deduce the entire amount of rainfall, the Signal Office is unable to give more definite information as to the extreme height to be reached or the date on which it will occur.

GREELY.

SPECIAL RIVER BULLETIN.

WASHINGTON CITY, *April* 2, 1890.

The Chief Signal Officer gives out the following regarding the Mississippi flood:

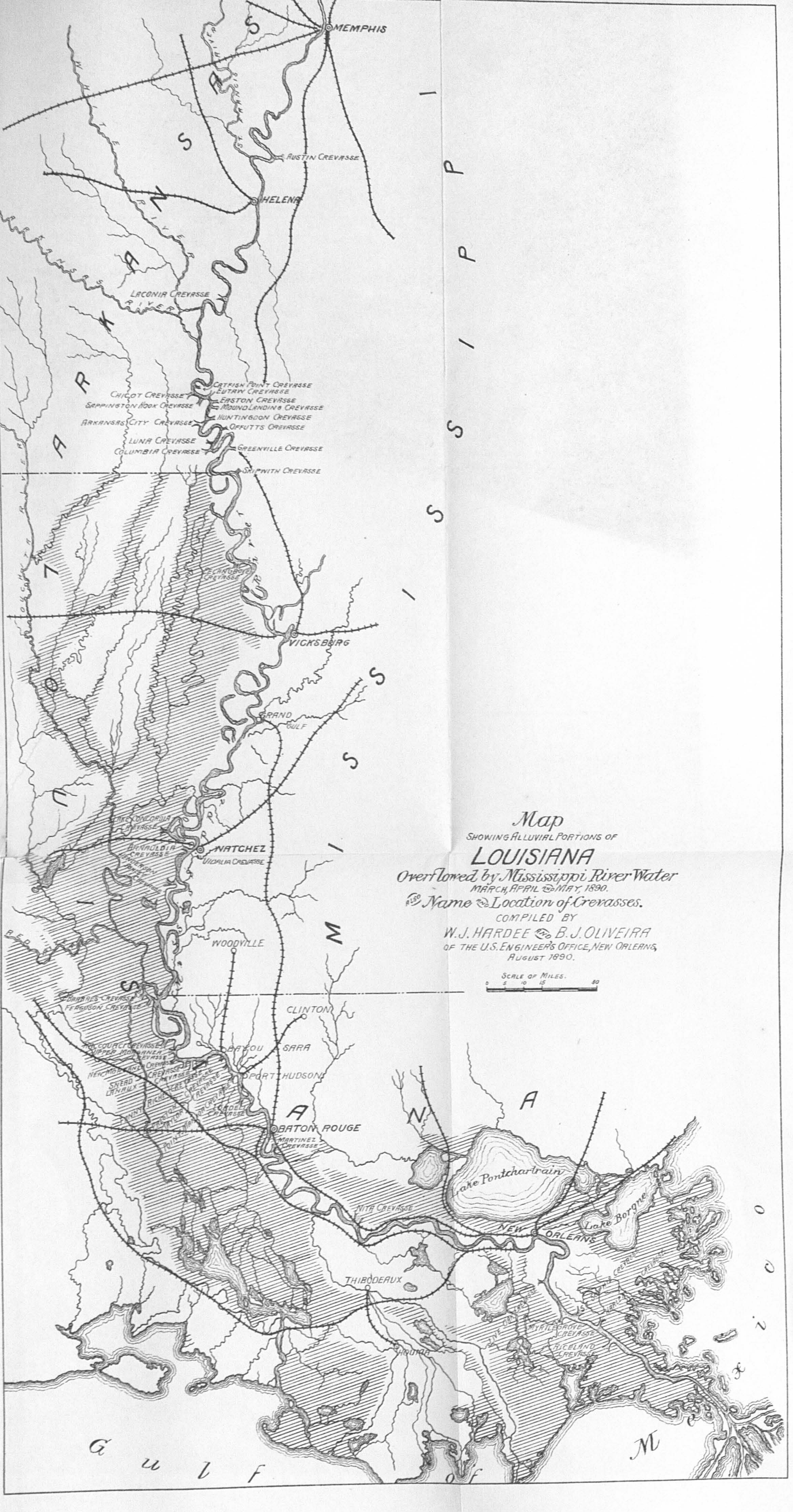
The Ohio reaches its highest point to-day, April 2, at Cairo, where the gauge reads 48.6 feet. The river has there risen 2 feet in eight days, and will now slowly fall. The Tennessee, Cumberland, and Upper Mississippi Rivers are falling rapidly, despite the fact that nearly 4 cubic miles of water have fallen in the past week in their catchment basins.

The rainfall in the past three days in the Vicksburg drainage area below Little Rock and Cairo is equal to 2 cubic miles of water, which is causing a rise in the Arkansas River, and of the Mississippi from Memphis to Vicksburg, inclusive, except slight falls at Helena, owing to the diminution of the backwater from the St. Francis bottom, and at Greenville, where serious crevasses have lately occurred.

The report sent out from New Orleans that the river has fallen 11 inches is incorrect, a rise of 1 inch having occurred since yesterday. The water now in sight below Cairo would cause a rise of 1 foot or more at Vicksburg by Monday, April 7, if the levees were standing, but the numerous crevasses must retard the crest of the flood wave and prolong its duration at a stage slightly higher than at present. Below Vicksburg the rise will be proportionately less, according to distance; at New Orleans this rise can scarcely exceed a few tenths of a foot, and will not equal the high water already past.

Considerable rain will fall to-day in the Lower Ohio, the Arkansas, the Red River, and Lower Missouri Valleys, and from St. Louis to Red River Landing; this rainfall, while tending to prolong the present flood conditions, will not materially aggravate the conditions as forecast above.

GREELY.



Map
SHOWING ALLUVIAL PORTIONS OF
LOUISIANA
Overflowed by Mississippi River Water
MARCH, APRIL AND MAY, 1890.
ALSO Name AND Location of Crevasses.
COMPILED BY
W. J. HARDEE AND B. J. OLIVEIRA
OF THE U.S. ENGINEER'S OFFICE, NEW ORLEANS,
AUGUST 1890.
SCALE OF MILES.
0 5 10 15 30
MEMPHIS
AUSTIN CREVASSE
HELENA
LACONIA CREVASSE
CATFISH POINT CREVASSE
EUTAW CREVASSE
EASTON CREVASSE
MOUND LANDING CREVASSE
HUNTINGDON CREVASSE
OFFUTTS CREVASSE
GREENVILLE CREVASSE
SKIPWITH CREVASSE
CHICOT CREVASSE
SAPPINGTON HOOK CREVASSE
ARKANSAS CITY CREVASSE
LUNA CREVASSE
COLUMBIA CREVASSE
VICKSBURG
GRAND GULF
NATCHEZ
VIDALIA CREVASSE
WOODVILLE
CLINTON
BAYOU SARA
PORT HUDSON
BATON ROUGE
MARTINEZ CREVASSE
NITA CREVASSE
Lake Pontchartrain
NEW ORLEANS
Lake Borgne
THIBODEAUX
HOUMA
MYRTLE GROVE CREVASSE
RICELAND CREVASSE
A R K A N S A S
M I S S I S S I P P I
L O U I S I A N A
Gulf of Mexico

APPENDIX 7.

REPORT OF THE OFFICER IN CHARGE OF THE STATIONS DIVISION.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, June 30, 1890.

SIR: I have the honor to submit the regular annual report, relative to the stations division, for the fiscal year ending this date.

PERSONNEL.

The present incumbent has remained as officer in charge, except during the month of July, 1889, when, during his absence with leave, Second Lieut. Frank Greene, Signal Corps, signal officer, performed the duties.

The clerical force at this office, which at the close of the past year numbered fifteen, has been subsequently further reduced, and now consists of fourteen, although the work of the division has materially increased in certain respects. This decrease has resulted from the systematized methods of transacting business, which render the present force sufficient for the ordinary work of the division. Most of the employés have, from practical experience in station duties and subsequent training at this office, become expert, not only in their respective duties, but in the general work of the division. Their value, therefore, both to the division and to the service, has proportionately increased. Their proficiency may be judged from the average grading obtained by seven clerks who were examined on May 3 and 12 by the United States Civil Service Commission. Their general average on the scale of 100 was 92.08, the range extending from 94.48 to 89.35. These results are exceedingly creditable, and will, it is believed, compare favorably not only with those obtained under similar circumstances in the other divisions of the office, but will, if an approximate standing be obtained in the latter, further serve to establish the fact that the employés of this office need fear no comparison in qualifications with the employés in other Bureaus and Departments of the Government.

As the duties of the division, as a rule, require not only special adaptability, but also experience and instruction, it would obviously be of advantage to make as few changes in the personnel as practicable.

The regular station force, comprising enlisted men on duty at the respective stations of the service outside of Washington City, consists at the close of the year of 298 men, graded as follows: 122 sergeants, 16 corporals, 116 first-class privates, and 44 second-class privates.

Their general conduct has been excellent throughout the year. The former high standard has in this respect not only, it is believed, been maintained, but the additional latitudes permitted in connection with local duties and the responsibilities imposed, in further pursuance of the progressive policy of the present Chief Signal Officer, have brought the employés into greater local prominence and importance, elevated both the office and the official to a higher plane in public estimation, tended to increase the self-respect of the employés, and also made them more guarded in their general conduct; in consequence, the gross misconducts and scandals arising from drunkenness and kindred vices have been reduced to a minimum, and the summary punishment which is now sure to follow such offenses and grave derelictions in general (discharge from the service), has soon relieved the corps of the very few discreditable men that have been found in its ranks. The marked care that has been exercised in the selection of recruits, both mentally and physically, has also inured to further raise the standard of the personnel, and the entire force now consists of a superior class of men, creditable to the service and the country.

The want of a school for instruction and training has been frequently felt during the year, and more especially in the last month, when, owing to the unusual number of discharges, slight embarrassments occurred in arranging for instructed men to fill positions requiring experience and training. Observers, too, especially those stationed in the larger cities, where there are recruiting rendezvous, have had their duties materially increased by the examination, presentation for enlistment, and subsequent instruction of recruits; but such action was unavoidable, and the only recourse open to the service under the circumstances.

The influence of Congressmen, prominent public officials, and private parties has been used to a considerable extent by certain employés of the service, with a view to obtaining special favors in changes of station, special assignments, etc., and surgeons' certificates, based frequently upon slight ailments, have been made the pretexts by others for special consideration. The careful examination made of the respective cases and attendant circumstances, and the marked discouragement that has been given undeserving applicants, have served to check these tendencies, though they still obtain to a limited extent. The unsettled condition of the service, owing to pending legislation, has also affected the personnel, rendering the observers anxious about the future and causing many to seek for influence rather than good deeds as an aid, if necessary, to future preferment.

The more courteous and equable treatment inaugurated by the present Chief Signal Officer has obtained during the year, to the general satisfaction of the employés.

DUTIES.

The duties of the division have been so fully discussed in preceding reports, and their general character so little changed, that it is not considered necessary to enter into a lengthened description. As heretofore they have embraced (except as regards station supplies, property and instruments, which pertain to the jurisdictions of the disbursing officer and instrumental official, respectively), the general administration of the stations of the service and of the employés and their work. This comprises the following details, under methods approved by the Chief Signal Officer: The arrangement for and proper performance of the meteorological and other duties devolving upon all classes of Signal Service stations, except State weather service and special river stations, in charge of paid civilian observers, which pertain to the province of other divisions of the office. The assignment, management and instruction of the enlisted force of the Signal Corps, and of the paid civilian observers, except at the stations above mentioned. The establishment, removal and discontinuance of stations, provisions for their inspection, and the preparation of routes for inspectors. Making recommendations for the guidance of the disbursing officer in equipping stations with supplies, furniture, etc. The exercise of a general supervision and control over the modes of disseminating weather data in public interests, and the submission and execution of general improvements in the interests of the service.

The clerical labor incidental has been exceedingly large, and is steadily increasing; but it has been handled promptly, communications to the office, as a rule, having been acted on and replied to upon the same day they reached the division. Considerable time and attention have been given during the year to station methods, which has resulted, in numerous instances, in the substitution of simpler and more economic modes and devices, better adapted to the respective requirements. The value of the service, as in former years, has gradually been accorded increased recognition, and its utility applied and tested in new directions. The wider field has demanded increased energy and action to meet the new necessities arising, and has entailed extra labor and responsibility, not only at the respective stations, but also to a considerable extent at this office in arranging and devising means and carrying them into operation. The frequent exigencies that have arisen at stations, affecting either the personnel or duties, have often demanded prompt action, and afforded opportunity for tests of judgment and discretion. No special embarrassments or detriments have, it is believed, resulted to the service therefrom.

Further information regarding duties will be found under subsequent captions in connection with details of station work.

LIST OF UNITED STATES SIGNAL SERVICE STATIONS (BY STATES), INCLUDING STATIONS OF THE FIRST, SECOND, AND THIRD ORDER; REPAIR STATIONS, DISPLAY STATIONS, SPECIAL RIVER STATIONS, SPECIAL COTTON-REGION STATIONS, SPECIAL RAINFALL STATIONS, AND STATE WEATHER SERVICE STATIONS.

Stations of the first order make two eye observations daily, and also record continuously important meteorological phenomena, such as wind direction and velocity, precipitation, temperature, barometric pressure, etc., by means of self-registering instruments.

Stations of the second order make two eye observations daily.

Stations of the third order make one eye observation, in addition to other special duties.

Repair stations are on the United States military telegraph lines, and note rainfall daily.

Special display stations display storm, cautionary and wind-direction signals upon orders received either directly from this office or from section centers (regular Signal Service stations).

The special river stations make one observation daily of the stage of water in the rivers and such additional observations as may be required during floods and dangerous rises.

Special cotton-region stations make one observation daily, from May 1 to November 30 each year, and telegraph it to district centers (regular Signal Service stations).

Special rainfall stations take one daily observation of rainfall, forward a monthly record of the same to this office, and report by telegraph to river district centers in case of very heavy rains.

State weather service stations coöperate with the various State weather services in collecting and disseminating meteorological information bearing on the climatological conditions of the State, and relative to the growth of its staple crops.

[Stations marked thus (*k*), indicate "Also State weather-service station." Those marked (*x*), "Also cotton-region station." Those marked (*z*), "Also special river station." Those marked (*j*), "Also display wind signals." Those marked (*v*) are stations that are maintained only during the summer months.]

States.	Stations.	Location.
Alabama	Second order	Mobile, Montgomery.
	Third order	Auburn (*k*).
	Special display	Fort Morgan.
	Special river	Decatur (*x*).
	Special cotton-region	Eufaula, Evergreen, Fort Deposit, Livingston, Marion, Opelika, Pine Apple, Selma, Tuscumbia.
Alaska	Second order	Bethel, Point Barrow.
	Third order	Anvik.
Arizona	Second order	Fort Grant, Yuma.
	Third order	Fort Apache, Fort Bowie, Fort Thomas, Fort Verde, Prescott, San Carlos, Willcox.
	Repair	Cooley's, Holbrook.
Arkansas	Second order	Fort Smith, Little Rock (*k*).
	Special river	Arkansas City, Camden, Dardanelle, Fulton, Helena (*x*), Newport (*x*).
	Special cotton-region	Brinkley, Devall's Bluff, Forrest City, Malvern, Monticello, Pine Bluff, Prescott, Russellville, Texarkana.
California	First order	San Diego, San Francisco.
	Second order	Eureka, Fresno City, Keeler, Los Angeles, Red Bluff, Sacremento.
	Third order	Point Reyes Light.
Colorada	First order	Denver.
	Second order	Colorado Springs (*k*), Montrose, Pueblo.
	Repair	Durango.
Connecticut	Second order	New Haven, New London.
	Special display	New Haven Light, Stonington.
Delaware	Special display	Delaware Breakwater.
District Columbia	First order	Washington City.
Florida	Second order	Jacksonville, Pensacola, Jupiter, Key West, Tampa, Titusville.
	Third order	Micco.
	Special display	Apalachicola, Cedar Keys, Fernandina, Fort George Island, Port Tampa.
	Special cotton-region	Live Oak.
Georgia	First order	Savannah.
	Second order	Atlanta, Augusta.
	Special display	Brunswick, Tybee Island.
	Special cotton-region	Albany, Allapaha, Athens, Bainbridge, Camak, Cartersville, Columbus, Eastman, Fort Gaines, Gainesville, Griffin, Jessup, Macon, Millen, Newnan, Quitman, Smithville, Thomasville, Toccoa, Union Point, Washington, Way Cross, Waynesborough, West Point.

States.	Stations.	Location.
Idaho	Second order	Boisé City.
Illinois	First order	Chicago.
	Second order	Cairo, Springfield (k).
	Special display	Chicago Water Crib.
	Special river	Beardstown, Grand Tower, Mount Carmel, Peoria, Warsaw.
	Special rainfall	Ottawa.
Indiana	Second order	Indianapolis (k).
	Special river	Evansville, Mount Vernon, Vincennes.
	Special rainfall	Huntington, La Fayette, Logansport, Rushville, Terre Haute.
Indian Territory	Second order	Fort Sill.
	Third order	Fort Reno, Fort Supply.
	Repair	El Reno, Woodward.
	Special rainfall	Eufaula, Tulsa.
Iowa	Second order	Davenport, Des Moines (k), Dubuque, Keokuk, Sioux City.
	Special river	Le Claire, Muscatine.
	Special rainfall	Cedar Rapids.
Kansas	First order	Dodge City.
	Second order	Concordia, Leavenworth, Wichita.
	Third order	Topeka (k).
	Special river	Manhattan.
	Special rainfall	Kirwin, Oberlin, Salina, Wallace.
Kentucky	Second order	Lexington, Louisville (k).
	Special river	Burnside, Catlettsburgh, Eddyville, Falmouth, Frankfort, Louisa, Paducah.
	Special rainfall	Bowling Green, Greensburgh, Williamsburgh.
Louisiana	First order	New Orleans (k).
	Second order	Shreveport.
	Third order	Port Eads (j).
	Special river	Alexandria (x), Coushatta Chute (x), Delhi, Girard, Monroe, West Melville.
	Special cotton-region	Amite City, Cheneyville, La Fayette, Minden, Monroe, Natchitoches.
Maine	First order	Eastport.
	Second order	Green Mountain (v), Portland.
	Special display	White Head.
Maryland	Second order	Baltimore.
	Special rainfall	Cumberland.
Massachusetts	First order	Boston (k).
	Second order	Nantucket.
	Third order	Vineyard Haven, Wood's Holl.
	Special display	Chatham, Gay Head Light, Gloucester, Great Point, Highland Light, Hull, Hyannis, Marblehead, New Bedford, Newburyport, Nobska Light, Provincetown, Tarpaulin Cove.
Michigan	First order	Detroit.
	Second order	Alpena, Grand Haven, Lansing (k), Manistee, Marquette, Port Huron, Saulte de Ste. Marie.
	Third order	Escanaba (j).
	Special display	Bay City, Charlevoix, Cheboygan, East Tawas, Frankfort, Glen Haven, Ludington, Mackinaw City, Menominee, Muskegon, Petoskey, Oscoda, St. Joseph, Sand Beach, South Haven, White Fish Point.
Minnesota	First order	Duluth, St. Paul (k).
	Second order	Moorhead, St. Vincent.
	Special rainfall	Alexandria, Fergus Falls, Fort Ripley, Ortonville, Redwood Falls, Tracy.

States.	Stations.	Location.
Mississippi	Second order	Meridian, Vicksburg.
	Third order	University (*k*).
	Special river	Yazoo City.
	Special cotton-region	Aberdeen, Batesville, Brookhaven, Columbus, Corinth, Edwards, Hazelhurst, Hernando, Holly Springs, Jackson, Lake, Macon, Natchez, Okolona, Port Gibson, Waynesborough.
Missouri	First order	Kansas City, St. Louis.
	Second order	Springfield.
	Third order	Columbia (*k*).
	Special river	Boonville, Hermann, Jerome, Louisiana, St. Joseph.
Montana	Second order	Fort Assinniboine, Fort Custer, Helena.
	Third order	Fort Maginnis.
	Repair	Custer Station, Galpin, Kintyre.
Nebraska	Second order	North Platte, Omaha, Valentine.
	Third order	Crete (*k*).
	Special river	Plattsmouth.
	Special rainfall	Culbertson.
Nevada	Second order	Winnemucca.
	Third order	Carson City (*k*).
New Hampshire	Second order	Manchester, Mount Washington (*v*).
	Special display	Portsmouth.
New Jersey	Second order	Atlantic City.
	Third order	Sandy Hook (*j*).
	Special display	Highland Light Beach.
	State weather-service	New Brunswick.
New Mexico	First order	Santa Fé.
	Second order	Fort Stanton.
	Third order	Lava.
	Repair	Watrous.
	Special rainfall	Springer.
New York	First order	Buffalo, New York City.
	Second order	Albany, Oswego, Rochester.
	Special display	Cape Vincent, Charlotte, City Island, Dunkirk, North Fair Haven, Sodus Point.
	State weather-service	Ithaca.
North Carolina	Second order	Charlotte, Hatteras, Raleigh (*k*), Wilmington.
	Third order	Kitty Hawk, Southport.
	Repair	Currituck Inlet.
	Special display	Morehead City, Washington.
	Special river	Mount Holly.
	Special cotton-region	Goldsborough, Lumberton, New Berne, Wadesborough, Weldon.
	Special rainfall	Asheville, Charleston, Murphy.
North Dakota	Second order	Bismarck, Fort Buford.
	Third order	Fort Yates.
Ohio	First order	Cincinnati, Cleveland.
	Second order	Columbus (*k*), Sandusky, Toledo.
	Special display	Ashtabula.
	Special river	Circleville, Marietta, Portsmouth, Zanesville.
	Special rainfall	Caledonia, Canton, Kenton, Mansfield, Sidney, Wooster.
Oregon	First order	Portland (*k*).
	Second order	Baker City, Roseburgh.
	Third order	Astoria.
Pennsylvania	First order	Philadelphia (*k*), Pittsburgh.
	Second order	Erie, Harrisburg.
	Special river	Brookville, Clarion, Confluence, Freeport, Greensborough, Johnstown, Lock No. 4, Mahoning, Oil City, Parker's Landing, Saltsburgh, Warren.

States.	Stations.	Location.
Pennsylvania	Special rainfall	Gettysburgh.
Rhode Island	Second order	Block Island.
	Third order	Narragansett Pier.
	Special display	Bristol, Newport, Point Judith, South East Light.
South Carolina	Second order	Charleston.
	Third order	Columbia (*k*).
	Special display	Georgetown, Port Royal.
	Special cotton-region	Allendale, Batesburgh, Blackville Branchville, Cheraw, Chester, Florence, Greensville, Greenwood, Hardeeville, Jacksonborough, Kingstree, St. George's, St. Matthew's, Spartanburg.
South Dakota	Second order	Fort Sully, Huron (*k*), Rapid City, Yankton.
Tennessee	First order	Memphis.
	Second order	Chattanooga, Knoxville, Nashville(*k*).
	Special river	Carthage, Charleston, Clinton, Columbia, Johnsonville, Kingston, Loudon, Rockwood, Strawberry Plains.
	Special cotton-region	Arlington, Bolivar, Brownsville, Covington, Dyersburgh, Grand Junction, Milan.
	Special rainfall	Rogersville.
Texas	First order	Galveston (*k*).
	Second order	Abilene, Brownsville, Corpus Christi, El Paso, Fort Elliott, Palestine, Rio Grande City, San Antonio.
	Repair	Edinburg, Marfa, Miami, Santa Maria.
	Special display	Port Lavaca, Velasco.
	Special cotton-region	Belton, Brenham, Columbia, Corsicana, Cuero, Dallas, Hearne, Houston, Howe, Huntsville, Longview, Luling, Orange, Paris, Tyler, Waco, Weatherford.
Utah	First order	Salt Lake City.
	Third order	Fort Du Chesne, Taylor's Ranche.
	Repair	Price.
Vermont	Second order	Mount Killington (*v*), Northfield.
Virginia	Second order	Lynchburgh, Norfolk.
	Third order	Cape Henry.
	Special display	Fort Monroe, West Point.
	Special rainfall	Abington, Christiansburgh, Woodstock.
Washington	Second order	Fort Canby, Olympia, Port Angeles, Spokane Falls, Walla Walla.
	Third order	Tatoosh Island.
	Repair	Neah Bay.
	Special display	Port Townsend, Seattle.
West Virginia	Second order	Parkersburgh.
	Special river	Charleston, Harper's Ferry, Hinton, Morgantown, Point Pleasant, Rowlesburgh, Weston, Wheeling.
	Special rainfall	Buckhannon, Glenville, White Sulphur Springs.
Wisconsin	Second order	Green Bay, La Crosse, Milwaukee.
	Special display	Ahnapee, Ashland, Kenosha, Kewaunee, Manitowoc, Racine, Sheboygan, Sturgeon Bay.
	Special rainfall	Chippewa Falls, Medford, Phillips, Portage.
Wyoming	Second order	Cheyenne, Fort McKinney, Fort Washakie.
	Third order	Rawlins.
	Repair	Carter.

RECAPITULATION OF STATIONS OF THE SIGNAL SERVICE IN OPERATION ON JUNE 30, 1890.

Stations of the first order (making continuous records by means of self-registering instruments)*	26
Stations of the second order (taking two observations daily)*	118
Stations of the third order (taking one observation daily at 8 p. m)*	34
Repair stations on United States military telegraph lines	15
Special display stations	73
Special river stations	72
Special cotton-region stations	114
Special rainfall stations	46
State weather-service stations (taking no observations)	2
Total stations in operation	500

LIST OF EDUCATIONAL INSTITUTIONS FURNISHED WITH WEATHER MAPS.

Station.	Number.	Station.	Number.
Boston	18	Nashville	2
Chattanooga	1	New Orleans	4
Chicago	5	New York City	13
Cincinnati	9	Philadelphia	1
Cleveland	1	Pittsburgh	1
Columbus	5	St. Louis	5
Denver	2	St. Paul	2
Des Moines	4	Sandusky	3
Detroit	2	Savannah	1
Erie	1	Sioux City	5
Harrisburg	1	Toledo	2
Indianapolis	3	Washington	27
Kansas City	2	Wilmington	1
Louisville	1		
Memphis	3	Total	130
Milwaukee	5		

CHANGES SINCE LAST REPORT.

Stations established.

Second order.—Meridian, Miss., July 1, 1889; Baker City, Oregon, July 1, 1889; Sioux City, Iowa, July 1, 1889; Mount Killington, Vermont, July 1, 1889; Tampa, Fla., March 13, 1890; Green Mountain, Mount Desert, Me., June 1, 1890 (reopened); Mount Washington, New Hampshire, June 1, 1890 (reopened); Mount Killington, Vermont, June 1, 1890 (reopened).

Third order.—Taylor's Ranch, Utah, July 1, 1889 (telegraph); Fort Maginnis, Mont., July 1, 1889 (changed from second order); Columbia, Mo., August 21, 1889 (State weather service).

Repair stations (telegraph lines).—Currituck Inlet, North Carolina, Instructions dated November 4, 1889; Holbrook, Ariz., Special Orders dated March 26, 1890; Cooley's, Arizona, Special Orders dated March 26, 1890; El Reno, Ind. T., Special Orders dated April 1, 1890.

Special display (storm signals).—Tarpaulin Cove, Massachusetts, September 14, 1889; Port Tampa, Florida, October 1, 1889; Gay Head Light, Massachusetts, November 15, 1889 (reopened); Georgetown, S. C., December 1, 1889; Velasco, Tex., December 15, 1889; Brunswick, Ga., February 1, 1890 (reopened); West Point, Va., February 15, 1890; Cedar Keys, Fla., April 1, 1890; Washington, N. C., March 15, 1890; Ashland, Wis., May 1, 1890 (reopened); Oscoda, Mich., June 10, 1890.

Special river.—Point Pleasant, W. Va., August 16, 1889.

Special rainfall.—Gettysburgh, Pa., July 1, 1889; Cumberland, Md., July 1, 1889; Woodstock, Va., July 1, 1889.

Special cotton region.—Howe, Tex., June 1, 1890.

Stations discontinued.

Second order.—Green Mountain, Mount Desert, Maine, September 10, 1889 (for the season); Mount Washington, New Hampshire, September 30, 1889 (for the season);

* Including also stations coöperating with State weather services.

Mount Killington, Vermont, October 1, 1889 (for the season); Cedar Keys, Fla., April 1, 1890.

Third order (telegraph).—Linkville, Oregon, November 1, 1889; Fort Klamath, Oregon, November 1, 1889; Ashland, Oregon, November 1, 1889; Fort McDowell, Ariz., February 28, 1890.

Repair stations (telegraph).—Sweetwater Bridge, Wyoming, Instructions dated August 12, 1889; Parker's, Oregon, Instructions dated October 22, 1889; Clallam Bay, Washington, Instructions dated December 9, 1889; Crescent Bay, Washington, Instructions dated December 9, 1889; Pysht, Wash., Instructions dated December 9, 1889; Webster, S. Dak., Instructions dated December 9, 1889; Phœnix, Ariz., Instructions dated December 17, 1889; Bordeaux, Wyo., Instructions dated December 31, 1889; Cantonment, Ind. T., Special Orders dated March 4, 1890.

Special display (storm signals).—Gay Head Light, Massachusetts, August 3, 1889.

Special river.—Gallipolis, Ohio, August 31, 1889.

Special cotton region.—Scottsborough, Ala., April 30, 1890; Smithville, Ga., June 30, 1890; Jesup, Ga., June 30, 1890; Live Oak, Fla., June 30, 1890.

STATIONS ESTABLISHED AND DISCONTINUED DURING THE YEAR.

	Established.	Discontinued.
Stations of the first order	0	0
Stations of the second order	5	1
Stations of the third order	3	4
Repair stations	4	9
Display stations	11	1
River stations	1	1
Cotton-region stations	1	4
Rainfall stations	3	0
Total	28	20

CAUTIONARY AND STORM-SIGNAL SERVICE.

This has, as in former years, been considered one of the most important and valuable branches of the work of the service, and past experience has, wherever possible, been utilized towards its improvement. It is believed that the popular verdict will concede that greater success has been obtained during the last year than heretofore, that fewer unnecessary signals have been ordered, and fewer failures made. These signals are displayed at 43 regular stations and at 75 substations. Fourteen regular stations have been designated as section centers, to each of which has been assigned a number of adjacent substations for general administration. On the Great Lakes there are at present in operation, including both the regular stations of the Service displaying signals and the substations, 48; on the Atlantic coast, 53; on the Gulf, 11, and on the Pacific, 6; making a total of 118 stations of all classes displaying signals. While, therefore, the field is as well covered as the appropriations will permit at present, yet the numerous requests received for the establishment of additional stations and the urgent necessities set forth for such action show unmistakably the value of the service, and the advantage, especially to marine and commercial interests, that would accrue by still further extending the system. These deductions are further emphasized by the action of prominent citizens, who, in several instances, have provided not only signals for display at their own expense, but have also volunteered to act as displaymen, without compensation, or secure others for that purpose.

The interests both of this Service and the public could undoubtedly be better subserved by an increased appropriation for this important branch of the Service. At present the displaymen at the substations receive merely a nominal sum for their services, ranging from \$5 to \$7.50 per month, out of which they are expected to pay for oil, wicking, etc., provide halyards, and keep the flags in repair. It can not, therefore, be reasonably expected that however conscientious, trustworthy, and enthusiastic they may be, they will subordinate their own interests to those of the Service for such meager compensation; it is, therefore, obvious that all interests would be better served by a more commensurate compensation to displaymen and the establishment of additional stations.

The former system of signals still obtains, but has been supplemented by an additional symbol, technically known as the "Information Signal," which was added after consulting ship-captains, owners, and others, and obtaining a generally favorable expression of their views regarding it. It consists of a yellow pennant of the same dimensions as the red and white pennants, and, when displayed, indicates that the local observer has received information from the central office of a storm covering a limited area, dangerous only for vessels about to sail to certain points. The signal serves as a notification to ship-masters that the necessary information will be given to them on application to the local observer. The use of the signal began on December 1, 1889. The display obviates, in many cases, the necessity for hoisting the "Cautionary Signal." In addition to this use, observers were informed on January 3, 1890, that, in case telegraphic communication with the central office was cut off and not liable to be restored within a short time, they were authorized to hoist the "Information Signal" when they consider a storm imminent that would endanger navigation. The utmost care was enjoined in this use of the signal, and in every case inquirers are informed of all the facts known to the observer.

The signal is in use at both regular and special display stations, and, at the former, when wind signals are ordered up at adjoining stations, observers are directed to hoist the "Information Signal" when they have reason to believe that local shipping may be interested in obtaining such information or be benefited thereby.

Although it is but a comparatively short time since this signal was introduced, its value has proven to be great.

The signals are displayed on the lakes only during the season of navigation. The season for last year closed at both regular and special stations as follows: Lakes Superior and Michigan, December 1; Lake Huron, December 5; Lake Erie, December 6; Lake Ontario, December 10; and opened this year on the following dates: Lakes Erie and Ontario, April 1; Lake Huron, April 11; Lake Michigan, April 16; Lake Superior, May 1.

COÖPERATION WITH THE HYDROGRAPHIC OFFICE.

At the request of the chief hydrographer the work of visiting vessels upon their arrival in port and obtaining information pertaining to storms encountered at sea, icebergs, wrecks, etc., and distributing pilot charts, supplements, and notices to mariners, was continued by the observers at—

Brownsville, Tex.	New London, Conn.
Charleston, S. C.	New Haven, Conn.
Eastport, Me.	Pensacola, Fla.
Galveston, Tex.	San Diego, Cal.
Key West, Fla.	Southport, N. C.
Mobile, Ala.	Wilmington, N. C.

In all, twelve stations.

As the duties increased so much in volume and became so onerous, it was necessary to require only such work performed in connection as could be done without interfering with the regular station duties, and to have a monthly report made showing the work performed and the time spent in coöperation.

The work has, in consequence, been materially reduced, so as not to impose hardship upon the observers, who have already ample regular duties, and yet to still permit valuable coöperation.

COTTON-REGION SERVICE.

This service has, as in former years, been of special interest and value, not only in the cotton-region belt, where the staple is cultivated and sold at the different marts and cotton exchanges, but also, though more indirectly, to the great commercial centers and, incidentally, to the interests of the entire country. The system has, within the year, been materially altered and improved, and it is hoped that the record of the current season will show at its close a marked improvement over that of preceding years, and justify the care and attention that have been spent in attempting to render it of higher practical value.

Late last season it was decided to change the period of cotton-region observations so as to commence on May 1 and continue until November 30, instead of, as in former years, extending from April 1 to October 31. This action was taken mainly in accordance with the wishes of those interested in the cultivation and sale of cotton, and the results, so far as known, have been more satisfactory.

Up to last year, the cotton-region observations were, as a rule, taken by the railroad operators or agents, who forwarded them over the railroad wires to the centers, whence they were transmitted to this office over the Western Union lines in the usual manner. This method had many disadvantages, the principal of which was that, in order to have the observations taken and the reports sent from the special stations, it was necessary to appoint employés of the railroads as observers. These men had not the advantages of previous training, either in the knowledge of meteorological conditions, or of even the simplest instruments, and as their time was so fully occupied with their special duties, the observations were neglected. So many changes of railroad employés were also made in the interests of the respective roads that it was very difficult to arrange for the frequent changes that occurred in the observers at the stations during the entire season.

A new plan has been adopted involving the employment of the voluntary coöperating observers of this Service at the usual small compensation (20 cents per observation taken, enciphered, and filed at the telegraph office), which will secure a higher class of observers, many of them meteorologists of local repute, who will, it is believed, from their active interest in weather conditions, give the service more care, time and labor, which must tend to materially enhance its value. In fact, more gratifying results have already arisen from this action.

The observations are transmitted in the usual way by the telegraph company, at stipulated rates below the ordinary.

This system has secured accuracy and speed, where formerly there were often embarrassing delays, carelessness, and gross inaccuracy, that the office was to a great extent powerless to remedy. The administration of the service and the changes in methods have caused much labor not only to the division, but also to the observers in charge of district centers, who have, in general, acted throughout with discretion and good judgment. During the year the observers in charge at the following Signal Service stations (the centers of districts) have inspected their substations:

District centers.	No. of substations.
Charleston	6
Little Rock	12
New Orleans	11
Savannah	12
Wilmington	7
Vicksburg	4

In addition, the observer at Atlanta inspected the station at Columbus, Ga., and the observer at Montgomery that at Opelika, Ala., making a total of 54 stations inspected during the year.

Reports from the inspectors show that a gratifying interest is taken in this work by the citizens of the localities where the stations are situated.

There are at present twelve district centers (regular stations of this service), and in operation 114 special cotton-region stations.

DUPLICATING PROCESSES.

The cyclostyle process was used by the Service during the greater part of the year, but as numerous complaints were received from stations regarding the tearing of the prepared paper sheet used as a stencil, before the impressions had been completed, and the issue of the edition was therefore interrupted until a new stencil had been made, experiments were made, both in the Stations Division and on station, with a view to obtaining a better method for doing the work, and one that would be more economical and not consume unnecessary time and labor. The Stations Officer submitted a report February 1, 1889, covering these experiments, but, while this report was undergoing examination, Sergeant J. W. Smith, in charge of the Boston station, submitted, on February 6, 1889, a report on his experiments with an inverted stencil placed on an ink pad used in connection with the cylinder press in obtaining a more rapid method of printing the lines on the weather maps, or by what is now known as the "milliograph process."

The experiments with the milliograph were continued in the Stations Division, under the personal supervision of the Stations Officer, and it was fully demonstrated that one of its great advantages was that prepared paper costing about one-fourth the price of that used could be substituted, and that the construction of a milliograph press for running off the large issue of maps at the printing stations was practicable. The report on these experiments was submitted to the Chief Signal Officer April 25, 1889, and by him referred to the Publications Officer, who states:

"There seems to be no doubt of the practicability of the inverted stencil. On account of the fact that the process does not require expensive paper for stencils, it is believed that it would be decidedly more economical for the Service, and I think that the Chief Signal Officer should secure from the patentees the privilege to use it for official purposes. In reference to the double cylinder press, mentioned in Stations Division report, there seems to be no doubt of its practicability."

On June 6, by order of the Chief Signal Officer, the observers at Chicago, Columbus, New Orleans, Springfield, Ill., and Toledo were selected and sent a crudely prepared milliograph, with instructions for its use, and orders to report in one month, giving therein their opinion as to the advisability of adopting the method permanently at their stations. The reports received from the stations were very encouraging; as an instance, Chicago states:

"The advantages suggested to me are the almost absolute cleanliness as compared with the cyclostyle process, the great number of copies that can be made from one stencil, the very trifling inconvenience resulting even if the stencil is torn, and the saving that can be effected by the use of paper of an inexpensive quality as compared with the paper now in use."

The reports from the other stations were of the same tenor, except that Columbus states that where only a few copies, ten or twenty-five, are required, with good cyclostyle paper, he prefers that method; for more copies the milliograph is superior.

The milliograph was explained to the Cyclostyle Company, and at their verbal request, under your verbal orders, the Stations Officer arranged for and was present at a practical test of the cyclostyle automatic foot-power duplicating apparatus, and the milliograph machine. The report of this test was submitted to the Chief Signal Officer on September 16 and was decided in favor of the milliograph machine.

The foot-power apparatus of the Cyclostyle Company and a hand-lever milliograph were sent to New York City and Boston, respectively, with orders to report on the merits of the two machines. The observer at New York City stated, after nearly a month's trial, that the foot-power cyclostyle machine was not suitable for the work, while the observer at Boston reported very favorably as to the milliograph.

Upon these recommendations and those previously received this office purchased 6 hand-lever, 20 large and 35 small milliographs, and distributed them to the various stations for use in issuing the publications. Observers at the stations thus supplied were, on June 19, ordered to report their personal preferences regarding the respective processes, and their comparative merits as the result of actual tests and experiments, giving, in connection, the time that each had been used at the station and additional pertinent data.

Observers at 14 stations preferred the milliograph process.

Observers at 19 stations preferred the cyclostyle process.

Observers at 12 stations preferred the cyclostyle process for small issues, but the milliograph where issues exceeded 25 or 30 copies.

As the issues by either process fully serve the purpose and present no material differences in legibility or general appearance, it is obvious that it will be advantageous to the Service to use the milliograph process, which seems to possess at least equal merits and which will, in the cost of prepared stencil paper alone, produce an annual saving of about $1,180, as milliograph stencil paper costs about one-fourth the price of that required for the cyclostyle process.

FROST WARNINGS.

These have been continued with decided benefit to the agricultural and commercial interests concerned. They are of special value at critical periods in the tobacco, cranberry, and cotton-growing districts, also to shippers of fruits and products liable to be injured by the occurrence of frost, and all parties materially interested in the growth of staples. The general plan in use the previous year for disseminating the information still obtains, the observers at designated stations bulleting the warnings received by telegraph from the central office, and using all available means, the local press, telephone, telegraph, etc., to promulgate the information for public benefit.

On November 11 a symbol, elsewhere generally utilized to apprise of advancing cold waves, technically known as the cold-wave flag (a white flag with a black square in the center), was designated as a frost-warning flag, to be displayed to forewarn of anticipated damaging frosts in certain sections, embracing the State of Florida and the Gulf and Pacific coasts, with the region 100 miles inland.

At regular Signal Service stations outside this section, the same symbol is also designated to be displayed as a frost warning in early autumn and late spring for the same purpose.

A special improvement was also inaugurated on October 24, in the system of reporting light and killing frosts to the central office from the regular stations, namely, to have each station telegraph, by the addition of a single word to its current report, the occurrence of each light frost until the first killing frost occurs, and each killing frost until the temperature falls to 32°, or until a frost occurs which is generally destructive to crop vegetation, *i. e.*, the staple products not materially injured by the earlier frosts destructive to delicate plants.

This change better serves public demands by permitting the issue of more specific information, and also furnishes fuller data for study and deduction.

INSTRUCTION.

Observers of the Service are expected not only to be conversant with the ordinary text-books of the Service and familiar with the modern advancements made in meteorology and kindred sciences, but also to have a good knowledge of the theory and practice of telegraphy and military signaling, and to fully instruct their assistants both in them and their official duties.

Since the loss of the school of instruction, recruits entering the Service must necessarily be assigned immediately after enlistment to stations, and their subsequent instruction and training are imposed upon the respective observers in charge. To offset the extra labor thus devolved upon the observers, who, as a rule, have already ample work, where practicable, recruits have been assigned as extra men, in addition to the regular station force, so as to permit their being utilized to compensate, as far as possible, for the time and labor given to their instruction.

The Morse alphabet superseded the former code for military signaling on June 28 (see General Order No. 59, Headquarters of the Army, Adjutant-General's Office, of that date), and enforced practice in military signaling was discontinued at stations early in January of this year.

Regular telegraph practice was also discontinued at the same time, except at 25 selected stations, where observers, as a rule, desired to continue the practice, or where such would be essential. Observers were informed, however, that it was expected that a natural pride in the work of the corps would induce all employés to render themselves familiar with any duties they were liable to be called upon to perform.

Thirty-five men have been instructed during the year. The entire course has averaged about six months, but could, if necessary, be completed in much less time. No special advantage would, under ordinary circumstances, be secured, it is thought, by shortening it, as additional labor would in that event necessarily be imposed, both upon the instructor and recruit, without adequate compensation.

LOCAL FORECASTS.

The tentative local forecasts of weather and temperature made by officers and selected observers stationed in the great commercial centers, which were begun early in June of the previous year, met with such general favor and success as to warrant the continuance and extension of the system. The list of observers authorized to make forecasts has been gradually increased from time to time. To some, dependent partly on local necessities and partly as to the judgment as to the competency of certain observers, authority has been granted to predict both weather and temperature; to others, to forecast weather only. At present, 31 observers are authorized to make forecasts for both, and 55 to predict weather only.

The Officer in Charge at Chicago has been authorized to make wind forecasts in addition to those of weather and temperature, and the Officer in Charge at San Francisco has, as in former years, continued to make forecasts for the Pacific coast region.

Early in the year, observers at stations issuing maps were authorized to include on the map, under proper caption, the local predictions made by themselves, in addition to the regular official forecast for their respective sections. These forecasts are for periods of twenty-four hours, and are based on one or the other of the regular observations. Their entry on the maps has added materially to the local value of the latter. As a rule, a high percentage of accuracy has been obtained; but it is not thought advisable to submit either a detailed statement or general average in connection, as the rules governing local verifications, which were only formulated in November, have not always been strictly adhered to by observers, owing to misinterpretation and other causes, and in some instances even the rules themselves have had to be modified or supplemented to suit new points that arose and which had not previously been covered by official decisions. The following official decisions now obtain as regards verifications of temperature:

A prediction of higher temperature is considered verified by a rise of one degree or more, and of lower temperature, by a corresponding fall.

When temperature predictions are made in the morning they are compared, for purposes of verification, with the minimum of the following morning; when made in the evening, with the maximum of the following evening.

A forecast of slight changes in temperature is verified from March to October by a change of four degrees, and from November to February, inclusive, by a change of six degrees.

OFFICES.

The former policy of the present Chief Signal Officer, which had inaugurated refurnishing, repairing, and putting the offices of the Service throughout the country (which had generally been shabbily furnished and provided for under his predecessors, and had become dingy and discreditable in appearance, from wear and tear of furniture, dust, smoke, etc.), into a presentable and comfortable condition, has been continued and practically completed, with gratifying results. By the exercise of good judgment and economic methods, the work has been done within the appropriations and without either embarrassment or detriment to other important interests. The comforts and conveniences of the observers have also been considered to a reasonable extent in the disbursements of appropriations, and the improved condition of their surroundings has added greatly to their satisfaction.

In order to keep the stations in a neat and clean condition it was decided in January to supplement the service of janitors and cleaners by the judicious hire once or twice per year, where necessary, of charwomen to thoroughly cleanse the offices. The small expenditure involved will, it is believed, be more than compensated by the more creditable condition of the offices.

The system that has obtained to a limited extent the previous year of locating the offices of the service in public buildings, where such privileges could be had from the proper authorities and suitable exposures for instruments obtained, has been continued. In pursuance of this policy, removals were made from rented quarters to the public buildings at Keokuk, Iowa; Lacrosse, Wis.; Marquette, Mich.; Rio Grande City, Tex.; Fort Stanton, N. Mex., and Wilmington, N. C. The erection and alteration of buildings adjacent to offices, which have impaired existing exposures of instruments, has caused, as in former years, the removal of a few offices into other buildings, where better facilities and accommodations were to be obtained—sometimes at lower rentals. Changes of location have been made as follows:

Chicago, Ill.
Cleveland, Ohio.
Colorado Springs, Colo.
Davenport, Iowa.
Dubuque, Iowa.
Fort Smith, Ark.
Kansas City, Mo.
Linkville, Oregon.
Lynchburg, Va.
Nashville, Tenn.
Pueblo, Colo.
Titusville, Fla.
Yankton, S. Dak.

The offices at Boisé City, Idaho; Norfolk, Va., and Raleigh, N. C., were moved to other rooms in the same buildings in order to obtain better accommodations.

At Grand Haven, Mich., the office was burned September 30, but by October 4 a new office had been obtained and observations resumed.

At Spokane Falls, Wash., the office was also destroyed by fire on August 4. Observations were resumed in temporary quarters August 6, and a permanent location was secured November 14.

Correspondence was had with the Treasury Department, and the assignment of rooms obtained for the use of offices in the public buildings now in course of erection at Augusta, Ga.; Louisville, Ky.; Pittsburgh, Pa.; Leavenworth, Kans., and Rochester, N. Y.

At Carson City, Nev.; Manchester, N. H., and Wichita, Kans., rooms were assigned in the new public buildings, but, as the roofs were not suitable for the proper exposure of instruments, the changes could not be made. Steps have already been taken towards obtaining from the proper authorities rooms for offices at Charlotte, N. C.; Charleston, S. C., and Duluth, Minn., and it is probable that assignments will be obtained in due season, when the buildings are completed. It was impossible to obtain public quarters at Dubuque, Iowa, and Santa Fé, N. Mex., as all the rooms had been assigned and were already occupied by other branches of the public service.

Attention is invited to the fact that complaints have occasionally been made by observers, where offices are located in public buildings, to the effect that the janitor force is insufficient to properly clean the rooms assigned to this service, and in a few instances small expenditures have been necessitated in consequence, to keep the offices in proper condition.

OFFICE HOURS AT STATIONS.

To obtain an approximate statement of the number of hours actually required daily at the respective stations for the performance of the current official duties, a circular was issued in December, calling for a statement showing the entire duties and average time required for each. On receipt of the respective reports, after a careful examination and revision, where necessary, the information was tabulated and arranged for future reference. It was ascertained therefrom that the average daily hours of consecutive duty needed to perform the current work at a regular station approximated 8.7 per man. At some stations the time was much in excess of this average, and at a few, less. These figures do not, however, fairly represent the number of hours actually required daily for station duty. The regular observations are made at 8 a. m. and 8 p. m., seventy-fifth meridian time, at all stations, and, as a rule, the greater and more important part of the day's labor occurs at, and for one or two hours after, these fixed periods, when each observer has to encipher his observation, prepare and deliver it at the telegraph office for transmission to the central office, or, if at a telegraph station, transmit it himself, and arrange for the receipt, if his station be other than a mere reporting station, of the reports from adjacent stations, which he must promptly translate and issue to the public in bulletin or map form, as may be required, and also to furnish the public press; in such cases the range of daily labor will average about thirteen hours, during which there will be brief periods of intermission. This, however, affords but little respite to the observer, who could better use the spare time, if it came together and not at intervals. Attention is also invited in this connection to the fact that observers in this service are on duty every day in the year, Sundays and holidays included, and that while the present Chief Signal Officer has, as far as practicable, restricted their labors on these days to the performance of only such duties as are absolutely necessary, yet every observer actually averages about thirty days' extra work of eight hours per day each year by labor on these days, when the majority of other employés and the public in general are using them for rest and relaxation.

At many stations where there is but one man to perform the entire work, the duties are arduous and confining, though every effort has been made to prevent hardships by reduction of unimportant work, and the hire, where the appropriations permitted, of messengers and assistants. It was impossible, in such cases, to furnish regularly enlisted assistants, owing to the more important demands at larger stations having greater public interests to be served. A marked reduction has, however, been affected generally in the daily hours of labor, and there is now much less reasonable ground for complaint regarding them than in former years. It is hoped that early next year, when the new appropriations become available, it may be possible to hire a few additional assistants to aid at certain stations where the hours still slightly exceed the average.

The compilation of station data in convenient form for handling, reference and reduction, which has heretofore been largely neglected at the respective stations, but which has been arranged for by the present Chief Signal Officer, has necessarily imposed much extra labor at the respective stations. Most observers have, however, readily seen the value and need of such action, and have zealously worked as time and opportunity permitted. Much has already been accomplished, and it is believed that early in the coming year the back data will have been so classified and arranged as to permit either the Bureau or observers at the respective stations to promptly furnish important meteorological data that could not formally have been obtained, except at the expense of much time and labor, a condition of affairs by no means creditable to the Service.

RAILWAY BULLETIN SERVICE.

The Railway Bulletin Service continues in operation on a number of railroads, principally east of the Mississippi River, and, as in the past, proves a successful mode of distributing weather forecasts and cold-wave warnings to a large number of points which have no other means of obtaining such information.

The following railroads are now coöperating with the Signal Service in the distribution of forecasts, etc., receiving their reports by telegraph, either direct from Washington City or through the various distributing centers, and bulleting the same daily at their local offices for the benefit of their employés and the general public on forms furnished by this office for the purpose:

Railroads.	Stations.	Railroads.	Stations.
Allegheny Valley	38	Old Colony	140
Baltimore and Ohio	67	Pennsylvania (Pennsylvania Division)	90
Baltimore and Ohio Southwestern	31	Peoria, Decatur and Evansville	33
Baltimore and Potomac	3	Philadelphia and Erie	35
Central Railroad of New Jersey	40	Philadelphia, Wilmington and Baltimore (Maryland Division)	19
Chicago and Iowa	23	Rock Island and Peoria	20
Cleveland, Cincinnati, Chicago and St. Louis (Cairo Division)	2	St. Louis, Alton and Springfield	13
Cumberland Valley	10	St. Louis, Arkansas and Texas	5
Huntingdon and Broad Top Mountain	8	Terre Haute and Peoria	27
Lehigh Valley	33	United Railroads of New Jersey Div. (Penna. R. R.)	48
Louisville, Evansville and St. Louis	28	Western Maryland	34
Northern Central	33	West Jersey	57
New York, Philadelphia and Norfolk	19		
Northeastern	6	Total	887
Ohio River	25		

It will be evident from this detailed report regarding weather signals that the system has received close consideration and careful supervision, that numerous improvements have been made, resulting in part from the experience of the previous year, and that while there has been a material increase in the modes of dissemination and display, the expense has not been proportionately increased, owing to the more economic methods of administration.

REVISION OF METEOROLOGICAL FORMS.

In November, a board of chiefs of divisions and senior clerks, of which the chief clerk of this division was a member, was appointed to revise and simplify the meteorological forms used by the Signal Service.

The following recommendations of this board were adopted:

A standard size for forms, 8 inches in width by 10 inches in length being the size adopted. Such forms as can not be made to conform to the standard to be, if larger, a multiple of the standard, and if smaller, to be one-third or two-thirds of the standard size.

To save time and labor to the observers, the plan of taking press copies of forms, instead of making them by hand, was adopted.

All forms to be numbered on the upper left-hand corner and the following series to be used: Meteorological forms to be numbered from 1001 to 1999, as the first series; forms of the accounts division to be numbered from 2001 to 2999, as the second series; telegraphic forms to be numbered from 3001 to 3999, as the third series; miscellaneous forms to be numbered from 4001 to 4999, as the fourth series; letter forms to be numbered from I in Roman notation, consecutively; maps to be lettered from A to Z, consecutively, in capitals.

Uniform headings and official designations of the various classes were also adopted.

All unnecessary forms were discontinued and those retained properly classified and numbered.

The following is a recapitulation of the work performed by the board:

Forms recommended discontinued	321
Forms recommended to be consolidated	40
Forms recommended to be retained	235
Total forms examined	596
Total forms consolidated or discontinued	361
Total forms retained	235

SIGNAL SERVICE EXHIBIT AT THE PARIS EXPOSITION.

The exhibit made by the U. S. Signal Service at the Paris Exposition of 1889 consisted of a set of the publications of the Service, a small display of instruments, and a set of original charts, compiled from eighteen years' observations taken in the United States. The display was in charge of Sergeant Park Morrill and continued from June 1 to November 1. The following are extracts from Sergeant Morrill's report:

"Owing to the crowded condition of the railroad between Havre and Paris the Signal Service exhibit, in company with many others, did not reach the Exposition grounds until after the official opening on May 6. It was received and completely installed by June 1 in the 'Palais des Arts Libéraux.' The exhibit, while not large, was well designed to show the character of the work being done by the service, and received much attention from persons having an intelligent interest in such subjects. The daily weather map, of which a supply had been provided for distribution, excited special interest, being far superior to anything published by other weather services in point of data given and area covered and in size and beauty of map. Thousands would have been taken away daily if they could have been obtained.

"The exhibit was entered in classes: 8, scientific expeditions; 15, instruments of precision; and 16, maps and charts. In presenting the Service to the juries upon these classes, I brought to their attention its extended work, embracing so large an organization and covering in its scope so extensive an area, collecting and giving to the public so large an amount of meteorological information, and, perhaps, upon these considerations, rather than strictly upon the exhibit shown, a grand prize was awarded in each of the three classes. A fourth grand prize was awarded in the name of the honorable Secretary of War for the Lady Franklin Bay Expedition. No exhibit of the United States Government received higher recognition, except that of the Department of Agriculture, which was a collective exhibit, involving a large outlay and much labor.

* * * * * * * * * *

"AWARDS.

"The estimation in which the Signal Service is held abroad is well shown by the award of a grand prize in each of the three classes in which it was entitled to entry, and in reality a fourth grand prize in that awarded to the War Department for the Lady Franklin Bay Expedition. This bestowal of the highest possible approval upon the service by three separate bodies of judges, not merely French, but international in composition, bespeaks its high reputation abroad."

TYPEWRITING MACHINES.

During the preceding year typewriters had been issued to a few of the larger stations for experiment regarding their utility and value; and, as they proved a practical success, additional stations were supplied from time to time during the past year, as opportunity permitted. Thirty-eight stations are now supplied therewith. They are of great utility in the issue of maps, bulletins, press reports, etc., as well as in official correspondence, and many ingenious methods have been devised by members of the Service for further increasing their field of usefulness in connection, especially, with various manifold copying processes.

WEATHER MAPS.

The marked advantages that weather maps possess over ordinary bulletins and reports of meteorological conditions have become more generally apparent, as the interest taken in the Service has increased, and the demand therefor has rapidly advanced. The graphic mode of presentation of data in map form is specially adapted to public needs, as any person, even of ordinary intelligence, after reading the explanation of the symbols and general plan as shown upon the map, can readily understand the meteorological status in the respective sections, and can soon learn to make his own deductions of future weather from observation of progressive changes, etc.

By the courtesy and coöperation of the postal authorities, who have rendered the Service and the public such valuable aid, a system of distribution which formerly obtained has been materially extended and improved.

At certain stations of the service designated as distributing centers, selected in proportion to local and surrounding population, importance and extent of interests to be subserved, facilities for mail distribution, and other causes, maps are promptly prepared from telegraphic reports received, and are issued in such numbers as are required and can be fully utilized; are displayed in the vicinity in the public interests, and are mailed to postmasters and others who coöperate in posting them when they reach their respective destinations, in frames supplied by this service; thus placing within the reach of the residents of towns and villages, who would otherwise be debarred from such information, weather data that has been collated but a few hours previously; for maps are only supplied to such places as can readily be reached by mail or other mode, while the information is still comparatively fresh and valuable. The official forecasts are also sent from the central office to the respective distributing centers for entry on the maps as well as for other purposes; but in some instances these fail, from lack of prompt telegraphic facilities or other insuperable difficulties, to reach the observer in time to prevent delay in issue. The observer in that case is authorized to issue the map, which already contains the local forecast made by himself, without incurring further delay in waiting for the official forecast from Washington. The public, therefore, obtain, with the map, a forecast of the weather for their section for the twenty-four hours beginning at the time the map was issued.

The system has been extended during the year so as to include the following stations:

Atlanta, Ga.	Pensacola, Fla.
Chattanooga, Tenn.	Philadelphia, Pa.
Harrisburg, Pa.	Portland, Me.
Knoxville, Tenn.	St. Paul, Minn.
Louisville, Ky.	Sioux City, Iowa.
Manistee, Mich.	

Issues have been made in the morning, or at night, dependent both upon the importance of local interests to be served and the mail facilities for supplying them promptly to surrounding towns. Maps are now issued at forty stations; at thirty-one in the morning and at four stations at night; at five stations, the most important, where mail facilities are unusually extensive, and where the public demand for weather data is urgent, both morning and night editions are issued.

Arrangements have been completed to begin the issue of p. m. weather maps at Chicago on July 1, as, owing to the present railroad schedules, there is a large number of post-offices within the radius of 100 miles which can not be reached with an a. m. map before the close of business for the day, but which can be furnished with a p. m. edition early next morning. The advantage, therefore, of the issue of a p. m. edition at that station is obvious, both in view of the greater circulation and because they thus reach the public before business hours on the succeeding morning, while the information is comparatively fresh; besides, the forecasts which appear thereon cover the day on which the map is received.

Observers have in all cases been instructed to use every effort to make the issue at regular times and at the earliest possible moment, so as to properly subserve the public interests. Every practicable plan has been considered and the most effectual known adopted to insure prompt receipt of reports by telegraph at the respective stations, and also to secure the prompt issue and transmission of official forecasts; but even with the greatest care, the maps are sometimes delayed materially at stations waiting for data, by circumstances beyond the control of this office. When, however, the forecasts are not received at the ordinary time, or a few unimportant reports are missing, the map is not delayed in consequence, but is promptly issued; the local forecast, if one is made at the station, being used instead of the official, under its proper notation as such.

The marked increase in the public demand for maps is well illustrated by the following figures, showing the respective issues for the fiscal years from 1886 to 1890, inclusive:

	Fiscal year.			
	1886–'87.	1887–'88.	1888–'89.	1889–'90.
Stations	52,248	274,411	683,947	876,394
Washington	126,000	117,750	175,053	193,140
Total	178,248	392,161	859,000	1,069,534

WEATHER SIGNALS.

The dissemination of official forecasts and warnings by the display of weather signals has grown materially in popular favor, as evidenced forcibly by the marked increase in the number of stations displaying them and the frequent new requests that are made for additional stations. The same general rule has obtained, as in the preceding year, viz, to furnish forecasts at public expense only to such points as can be reached for a telegraphic tariff of ten cents per message, or less, dependent on the number of stations supplied from any distributing center. To several applicants, therefore, who desired to establish displays, it has been impracticable to grant the forecasts when extra tariffs were involved in the transmission of telegrams over the lines of more than one company. In many instances, however, such concessions have been made or arrangements provided so as to permit sending the forecasts at the usual tariff. In a few cases, where unusual public interests were involved or special reasons existed for such action, a double tariff has been permitted where no other economic method could be arranged for meeting the necessities of the case.

Eight hundred and twenty-eight stations are now furnished the official forecasts for these displays. During the year 299 stations have been established and 198 stations discontinued.

By a comparison of State lists it is found that Iowa has the largest number of weather signal display stations receiving forecasts by telegraph at Government expense. The following list shows the number of stations now in operation in each State:

States and Territories.	No.	States and Territories.	No.
Alabama	7	Nebraska	34
Arkansas	13	Nevada	4
California	1	New Hampshire	5
Colorado	5	New Jersey	12
Connecticut	2	New Mexico	1
Delaware	3	New York	49
Florida	14	North Carolina	28
Georgia	10	North Dakota	9
Illinois	43	Ohio	41
Indiana	54	Oregon	10
Iowa	60	Pennsylvania	43
Kansas	41	South Carolina	25
Kentucky	16	South Dakota	13
Louisiana	36	Tennessee	15
Maine	4	Texas	24
Maryland	2	Vermont	5
Massachusetts	14	Virginia	16
Michigan	59	Washington	1
Minnesota	19	West Virginia	4
Mississippi	21	Wisconsin	12
Missouri	48	Wyoming	2

NOTE.—Stations in California (supplied with forecasts from San Francisco) receive such only from November 1 to and including May 30.

Upon the suggestion of this office, that possibly the reports might not be as valuable for the display of signals during the summer months to interests concerned, the displaymen at 113 stations stated that the forecasts could be temporarily discontinued for that period without detriment, and the respective distributing centers were instructed to that effect, thereby permitting considerable saving to the telegraph appropriation.

At a few stations in the State of Missouri a system of weather signals by steam whistle is now in operation, and this mode of disseminating weather information for long distances, in some instances over 10 miles, has met with great success in the districts in which it has been inaugurated.

The following code of whistle signals, now in use at Columbia, Mo., is furnished for the general information:

One long and one short.—Fair and colder.
One long and two short.—Fair and warmer.
Two long and one short.—Rain or snow and colder.
Two long and two short.—Rain or snow and warmer.
One long alone.—Fair; stationary temperature.
Two long alone.—Rain or snow and stationary temperature.
One long, one short, and two long.—Fair and colder, followed by rain or snow.
One long, two short, and two long.—Fair and warmer, followed by rain or snow.
Two long, one short, and one long.—Rain or snow and colder, followed by fair.
Two long, two short, and one long.—Rain or snow and warmer, followed by fair.
Three long.—Cold wave.
Four long alone.—Frost and severe storm.
Long whistles refer to the weather.
Short whistles refer to the temperature.

On September 2, all displaymen at special cold-wave stations were requested to state what disposition they made of warnings sent them at Government expense; if the cold-wave flag was displayed, and whether they wished the telegrams continued during the coming season; also as to what interests were most benefited by the displays. Replies to this letter indicated that the warnings were highly appreciated and of the utmost benefit to a great variety of agricultural interests, and that the flag displays were promptly made upon receipt of warnings from the distributing centers.

From failure to reply to this communication, notification of the removal of displaymen, and for other causes, 27 of the special cold-wave stations were dropped from the lists.

On September 3, all displaymen in Missouri were requested to render their monthly reports of displays to the observer at Columbia, Mo., instead of to St. Louis, the State Service headquarters having been transferred to the former station.

On November 16, all displaymen receiving the p. m. forecasts were informed that the a. m. forecasts, which could be made to reach them at or before 12, noon, would, if they so desired, be substituted for those sent; and request was made that those most interested be consulted, and this office informed as to which forecasts were preferred for the display of signals. Of the number replying to this communication, nearly 70 per cent desired the a. m. forecasts, and action was taken to that effect, the change being made January 1. After this date all new stations were given an opportunity to state their preference for the forecasts desired, the result being that a very large proportion prefered the a. m. forecasts, the messages, as a rule, reaching them within three or four hours after the time the p. m. forecasts could be received, and covering a period of time twelve hours later.

All stations receiving a. m. forecasts were, on December 20, informed as to the time covered by such predictions, and fully instructed as to the proper entries (as to their verification or non-verification) to be made on the monthly reports.

On December 23, distributing centers were supplied with lists showing, respectively, the substations desiring a. m. and p. m. forecasts; the necessary changes to go into effect on January 1. The observers were directed to use the utmost dispatch in getting the forecasts (especially the a. m.) to the telegraph office for distribution to the stations named, so they might reach their destination at the earliest practicable moment.

On January 17, by arrangements perfected through the Michigan State Service, the forecasts and warnings were authorized sent by telephone from Lansing, at the expense of this Service, to nearly 50 substations, which had been previously supplied by the State Service with the necessary flags for the display of weather signals.

With a view to ascertaining the hours at which local telegraph offices at display stations were open on Sunday, each displayman was, on January 28, requested to furnish this office with the desired information, in order that distributing centers might be notified, and so prevent the filing of telegrams for substations at which the telegraph service on the day in question was not such as to admit of the warnings being delivered to displaymen in time to be of value. The information contained in the replies to this letter was tabulated and furnished to distributing centers on February 24, with instructions covering its use.

A number of displaymen having requested Sunday forecasts, a circular letter was, on March 4, sent to all applicants, informing them that, in conformity with the practice of other bureaus of the Government regarding labor not absolutely necessary on the Sabbath, and in deference to public opinion in that respect, only a general prediction will be issued, unless unusual atmospheric disturbances are anticipated, in which latter case the particular section is designated and the information disseminated through the Associated Press or by special message to stations having interests which would be affected by such sudden and decided changes.

On March 12, observers at distributing centers were instructed to delay for fifteen minutes the forwarding of forecasts containing warnings of frosts or cold waves, in anticipation of the receipt of an order to hoist cold-wave signals; in which latter case the cold-wave order would be substituted for the warning in the message to substations. If the order is received after the time limit has expired, it will be reported at once by special message to all stations affected.

On March 19, each displayman was instructed as to the display of signals for temperature, when warnings are embodied in the forecasts message, without specific orders to hoist the cold-wave flag: also as to the mode of verifying cold-wave warnings.

To provide for the more prompt distribution of forecasts and warnings to weather signal-display stations in western New York, Buffalo was, on April 11, announced as a distributing center for that section of the State, the service to commence on April 15; and all western New York stations, formerly supplied with those reports from New York City, were, on the latter date, placed under the supervision of the observer at Buffalo.

On May 1, the observer in charge at each distributing center was furnished with a map, or maps, showing the location of each display station receiving forecasts and warnings from his station at Government expense, with index for the same. These maps were supplied in order that the proper forecasts, etc., for the section of the State in which each substation is located might be sent to that particular point.

The nonrendering of monthly reports by displaymen was made the subject of complaint by a few distributing centers; but, in most instances, upon the matter being brought to the attention of the delinquents, assurances were given by the displaymen of prompt compliance with instructions in future. In cases of continued neglect in this particular, the stations were dropped from the list.

WEATHER REPORTS FROM THE WEST INDIES.

The arrangements referred to in last Annual Report, for the receipt of cablegram weather reports from West Indies stations, by the coöperation of the Director of the Naval Observatory at Havana, on behalf of the Spanish Government, for which, by way of reciprocity, the Chief Signal Officer agreed to furnish similar data from United States stations, practically failed on the part of the Spanish authorities, who only succeeded in furnishing regularly reports from Havana, owing, it is believed, to lack of available appropriations, and inability to obtain concessions from the cable companies. A new project, however, to obtain reports by the coöperation of the United States consuls, is under consideration, as explained hereafter, which it is hoped will prove more successful.

A communication, dated March 6, 1890, from Mr. Mortimer A. Turner, United States consul at St. Thomas, West Indies, urging the establishment of an auxiliary Signal Service station at St. Thomas, and emphasizing the great importance of the same to maritime interests, was referred by the Honorable the Secretary of State to the War Department on April 9, and subsequently in the usual manner to the Chief Signal Officer, who addressed the following reply to the Honorable the Secretary of War, on June 26, 1890, which was forwarded to the State Department on the following day:

"Referring to the letter from the Honorable the Secretary of State, dated Department of State, Washington, D. C., April 9, 1890, with inclosures relative to the establishment of an auxiliary Signal Service station at St. Thomas, West Indies, I have the honor to state that the importance of securing reliable meteorological reports from the West Indies, especially during the hurricane season from July 15 to October 15, has always been recognized by this office. Strong efforts have been made to secure these reports in time to give the maritime interests of the country ample warning of the approach of dangerous storms which frequently pass over these islands before reaching the coast of the United States. Past arrangements for obtaining these reports have not proved satisfactory, owing to the great difficulty encountered in securing persons as observers whose ability, fidelity, and punctuality insure the correct taking of observations, their enciphering and filing at the telegraph stations; but it is believed that, by the powerful intervention of the Department of State, the cordial and active assistance of its consuls in the Latin-American States can be obtained in aiding in securing accurate, reliable, and punctual reports, which will enable the Chief Signal Officer to comply with the law which requires the Signal Service to give notice of the approach and force of storms on the seacoast of the United States.

"The establishment of auxiliary Signal Service stations at St. Thomas; Santo Domingo; Kingston, Jamaica, and Santiago de Cuba is considered necessary in order to carry out this project.

"I therefore have the honor to recommend that the Department of State be requested to so interest the consuls at these points in the matter that they may recommend suitable persons as observers, to whom the necessary instruments will be furnished by this service and who will each receive a compensation of $1 per day for his services as observer. The observer will be required to take and telegraph two regular observations daily—at 7 a. m. and 6 p. m.—and to send special observations in case of threatening conditions; the whole time to be consumed in this work probably not exceeding an hour each day.

"As soon as this office is advised that favorable action has been taken, the consuls will be commnicated with directly as to details."

The perfection of this plan would enable the Chief Signal Officer to give early and full information of the approach and location of West Indian cyclones, during the hurricane season, and other storms, and the benefits accruing therefrom in the saving of life and property would be incalculable. The advantages derived would not be confined to our own commerce, but would extend also to the maritime interests of other nations.

WASHINGTON STATION.

The Washington station of observation is still in the cupola originally occupied. and the location is satisfactory. The room was, until recently, from lack of available storage facilities, partially filled with the self-recording instruments and other property belonging to the instrument division; but the greater portion has been removed.

Observations with the sunshine recorder were commenced on February 1 and have continued.

The observer keeps the monthly record sheets made by the thermograph in the station instrument shelter, and also those from the barograph now in the forecasts division.

The wires running to the self-registering instruments on the roof have been arranged in one cable, and the loose wires have been removed.

The following changes have been made in the instruments since last report: The vertical minimum thermometer was substituted for the horizontal minimum on November 1; the old anemometer was exchanged for a new one on February 12, and on April 25 a new barometer box was put up, which is a great improvement on that of the old style.

MISCELLANEOUS.

The following data have been compiled at times when other duties would permit:

Wind data for Washington City; showing total hourly wind movement, by months, with prevailing direction for each hour, percentage for each direction, and number of miles from each direction (partly from sixteen and partly from seventeen years' observations).

Rainfall data for Washington City; showing total monthly amount by hours (fifteen years' observations).

Temperature data for Washington City; showing mean monthly average temperature for each observation, with average maximum and minimum (fifteen years' observations).

During the year 2,100 monthly abstracts of journal have been examined; the acknowledgment of all general orders, circulars, and circular letters mailed to stations has been checked, and the correspondence division notified as to all general orders and circulars reported missing from station files.

A monthly report, showing absence on account of sickness and cost of medical attendance and medicines (enlisted men on station), has been rendered to the Chief Signal Officer for his information and that of the disbursing officer of this service.

Two hundred and fifty-seven changes in station of the enlisted force have been made in special orders on the recommendation of the stations officer.

Twelve routes to be followed by inspectors have been outlined and maps of the same made for the use of the Chief Signal Officer.

Seventeen changes in station on account of ill-health have been granted enlisted men of the Signal Corps.

Total number of days the enlisted men of the Signal Corps were absent from duty on account of sickness, during the fiscal year, 864; 1 per cent.

Total number of days the enlisted men of the Signal Corps were absent from duty on account of leaves of absence and furloughs granted during the fiscal year, 2,872; 2.7 per cent.

SUBMISSIONS FOR CONSIDERATION

Organization.—The value of some definite organization, fixing the status of the service on a permanent basis, is so obvious and would be evidently so beneficial both to the interests of the members of the corps and to the public, as to need no arguments. Should the bills now pending in Congress for the organization of a military Signal Corps proper and a civilian weather bureau fail to secure such action, the propriety is respectfully submitted of the formulation and presentation of a bill for an organization, partly military and partly civil, to embrace both services or for such other special mode of organization as may be most consistent with the wishes and policy of the Chief Signal Officer.

A corps having the observers in charge at first and second order stations enlisted, with a subordinate force of assistants, part enlisted and part civilian, to be determined by the respective local necessities and interests, and with civilian employés to coöperate with State Weather Services, would, it is believed, be found well suited to the varied needs of both services.

The necessity for *some* organization can not be overestimated, as the present indefinite status is neither calculated to retain worthy and capable employés, call forth their highest energies and abilities, or replete the ranks with men possessing the qualifications and attainments needed in such an important public service, demanding for its success talent of the highest order.

Recruiting and instruction.—These might, in the event of the establishment of such an organization as is above outlined, be readily arranged for, it is thought, at those posts now designated as Army schools of instruction, where signal officers are or might be assigned. After preliminary examination, such as now obtains, desirable candidates for enlistment who reach a high percentage might, as vacancies arise, be authorized to report to such officers at their own expense for final examination and enlistment if found qualified, and might, after enlistment, under the supervision of these signal officers, be thoroughly trained and instructed in their future work with but little expense to the United States until their services were needed elsewhere.

Salaries.—The rates of commutations, legally authorized enlisted men, which have already been so carefully adjusted by the Chief Signal Officer, should, when practicable, if no change occurs in the present status of the employés, be again revised with a view to a still more equitable distribution, especially in the larger cities, where the respective costs of living are so varied.

The retention, also, of a thoroughly efficient and competent corps of clerks in the divisions at this office deserves consideration. To this end, therefore, such provisions should be made for advancement in grade and pay as may be practicable and in accordance with the views and policy of the Chief Signal Officer, else, as experience has taught, transfers will be sought and secured to other bureaus of the Government where more rapid promotion and higher grades of pay offer superior inducements.

Mr. T. B. Harrison has continued as chief clerk of the division, and the stations officer would feel derelict in his duty should he fail to bear testimony to his value and efficiency. His familiarity with station affairs has been of great utility in connection with their administration, and his zeal, judgment and discretion admirable.

The entire clerical force of the division have also performed their respective duties with great fidelity and efficiency. Many improvements in modes and appliances have been made from the practical suggestions offered by them, emanating frequently from evident close personal interest, both in their specific duties and the work of the service. The duties of the division have been performed by all with the utmost harmony and good will, much to the satisfaction of the officer in charge, who takes pleasure in presenting these facts to the Chief Signal Officer.

Very respectfully,

JAS. MITCHELL,

Second Lieutenant, Signal Corps, Assistant and Stations Officer.

The CHIEF SIGNAL OFFICER.

APPENDIX 8.

REPORT OF THE OFFICER IN CHARGE OF THE STATE WEATHER SERVICE.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington, D. C., September 5, 1890.

SIR: I have the honor to submit the following report of the operations of State weather services and meteorological societies coöperating with the Signal Service during the year ending June 30, 1890.

There are at present 28 local weather services in operation, covering the territory of thirty-four States; and the experience of the past year furnishes additional proof of the value of State services coöperating with the national service. The detailed reports of the directors of the several services, herewith inclosed, show the many benefits resulting to the people of the States in which such organizations exist by affording means for the rapid dissemination of the weather forecasts, cold wave, frost, and flood warnings issued by the national service; and it is gratifying to note that the general verdict of the local services is commendatory of the work of this office, and that the accuracy of the forecasts and warnings issued by the central office has increased, and that they are more thoroughly understood, and therefore more largely utilized by those interested.

The liberal policy of coöperation inaugurated by the present Chief Signal Officer has not only enabled the local services receiving support from other sources to largely increase the number of stations, but has resulted in maintaining other local services, which must, of necessity, have ceased to exist had not the Chief Signal Officer supplied the assistants and necessary instruments for continuing these services. The benefits resulting to the Signal Service from a large increase in the number of stations, which was made possible by the recent legislation authorizing the purchase and distribution of meteorological instruments to voluntary observers, will be apparent from an examination of the tables and charts published in the Monthly Weather Review of this service. The meteorological data collected from these stations has enabled this service to publish more accurate charts of monthly rainfall and temperature, and to supply data from which the climatic conditions of each section of the country may be definitely determined, thus affording information which will define the regions best suited for the cultivation of particular crops. It is hoped that the appropriation for the purchase of instruments to be distributed to voluntary observers may be continued until each county in the several States is supplied with at least one station.

A number of these services have inaugurated special investigation of subjects pertaining to general meteorology, which will doubtless prove valuable to the national weather service. For example, the report on thunderstorms in New England, to be published in the next annual report of the New England Meteorological Society. Also a review of the cyclonic storms that traversed New England in 1889, and an investigation of sea breezes in New England, and other discussions which may be utilized in the general work of the national weather service.

The State services in Pennsylvania, New York, and Michigan are issuing monthly charts of normal rainfall and temperature, which are not only valuable for determining the climatic conditions, but afford a ready means of determining the departures in rainfall and temperature of the current months. The organization of the State weather service in Pennsylvania afforded the means of furnishing complete and reliable data of the rainfall which caused the destructive floods in that State on May 31 and June 1 of last year, and the records thus supplied have been freely used in the settlement of claims for damages caused by floods.

The services in the States on the eastern slope of the Rocky Mountains and those of Nevada and Oregon are supplying data which will become useful in the solution of the irrigation problem, which is one of the first importance in those regions.

The services in the Southern and Western States publish monthly bulletins, which have been largely utilized by the local and State authorities, with a view of inducing immigration. In addition to other benefits resulting from the organization of the

Texas State weather service, the meteorological reports received from the stations of that service are now being tabulated by the assistant of that service, Sergeant Cline, who is a physician, with a view of determining the relations which sudden and decided changes in temperature bear to the death rate. He has at his command fifteen years' record of temperature and deaths in the city of Galveston, and it is believed that his deductions will be valuable to medical meteorology.

The organization of the Kentucky service has resulted in the establishment of a complete system of stations, covering the tobacco region of that State, at which will be received the frost warnings issued by this service, the system having been inaugurated last year and extended during the present season.

A special system of flood warnings has been organized in connection with the South Carolina service, which is in successful operation.

Prof. R. B. Fulton, director of the meteorological service of Mississippi, states that "the national weather service has been of incalculable benefit to the people of the Delta region in this State during the past year in foretelling the extent and duration of high water in the Mississippi River," and he is also of the opinion that the benefits of the national service might be extended to the shipping interests of that State by the display of storm warnings on the Gulf coast, where about one thousand men are employed in fisheries and lumber shipping.

I have enumerated above some of the special advantages resulting from the organization of local and State weather services, while the detailed reports of the directors will show that these services are being utilized in the varied interests of the country.

WEATHER CROP BULLETIN.

The weather crop bulletin of the Signal Service has been regularly issued during the year, this being a monthly bulletin during the winter months and a weekly bulletin during the growing season, from March 1 to October 1. This bulletin contains a weekly summary of the temperature and rainfall based upon reports from telegraphic stations, and a comparison of the same with the normal conditions for both the current week and the entire season from January 1 to the date of the bulletin. It is also accompanied by general remarks based upon telegrams forwarded from the central stations of State services, giving the prevailing weather conditions and the effect of weather upon the growing crops. These telegrams are based upon reports received by mail from numerous observers throughout the State, submitted in time to reach the State center by Saturday morning, so that the weekly bulletin presents a reliable summary of the meteorological conditions and the effect of the same upon the principal crops throughout the agricultural regions of the United States. This bulletin is also accompanied by a tabular statement containing the data upon which it is based, and it is issued and mailed on Saturday night in time to reach the principal commercial centers before the opening of trade on Monday morning. This bulletin is supplemented by the weekly crop bulletins issued by the State services, each State service issuing its own bulletin, based upon mail reports.

There is no feature of the weather service which has met with such universal favor and been so highly commended as the weather crop bulletin. The weekly weather crop bulletin issued by the Signal Service has been commended by boards of trade in the wheat and cotton regions; it is regularly telegraphed as an item of news by the press associations and published by the principal journals of the country, and is also cabled to Europe to parties interested in the staple crops of this country. Considered in connection with the local State bulletins, it places before the people of the country at weekly intervals a reliable statement as to the conditions of the weather and the effect of the same upon crops. This information has been largely used to advantage by both the producer and dealer, and places both upon an equal footing. The State crop bulletins are exchanged, and each board of trade is supplied with copies of all State bulletins throughout the cotton region for the benefit of its members, so that the condition of the crop in all sections may be accurately known.

The director of the Tennessee weather service, in referring to this feature of Signal Service work, writes as follows:

"Of all the bulletins emanating from the Signal Office or its weather service adjuncts in various States, this is by far the most important to those interested in the products of the soil, and a growing interest is manifested in the increased demand for it.

* * * * * * *

"This publication has done more to popularize the Signal Service with all those who are concerned either in the direct production or handling of agricultural products than perhaps any other, certainly in this State, because it brings to them officially each week the latest and most reliable information concerning the growth and maturity and prospects of the various crops of the country. It is not saying too much that the efforts of the Chief Signal Officer in this direction have been attended with the best results, and he has made the service invaluable to the farmer and to the commercial man through the medium of this adjunct to the service. It has been reserved for the weather crop bulletin to bring directly home to the citizen the practical value of the Signal Service, and so long as it is properly maintained, supplementing the daily forecasts, the service will be regarded by the average citizen as one of the greatest blessings under the Government."

It will be seen from the reports of the directors of State services that the weather crop bulletin is generally regarded as one of the most important features of Signal Service work, and its success gives evidence of foresight and ability in the present administration of the Signal Service, under which this important branch of work was inaugurated.

There is also issued, from the data upon which the weather crop bulletin is based, charts representing the excess and deficiency of temperature and rainfall throughout the United States. These charts are prepared weekly and supplied to the Superintendent of the Marine Hospital Service, who included them with a tabular statement in the weekly abstract or sanitary reports issued by the Marine Hospital Service. The first issue of these charts occurred on April 11 of the current year, and they have been continued without interruption since that date. They present the conditions of temperature and moisture in such a form as to render it possible to readily study these conditions in connection with special diseases.

Inclosed will be found a list of State weather services containing the name of the central station, the name of the director, and the name of the Signal Service assistant of each service.

The Signal Service men, acting as assistants, have been selected on account of their special fitness for the work to be performed, and they are to be commended for the faithful and efficient manner in which they have performed their duties.

While no regularly organized service exists either in Virginia or California, weather crop services have been organized in those States, which have received the hearty indorsement of many agriculturists interested in crop bulletins, and it is hoped that these experimental services may be followed by permanent organizations.

Of the services now in operation, ten have been organized by legislative enactments and receive support from the State government, while the Chief Signal Officer continues to coöperate and lend valuable assistance to all State services, detailing men as assistants, furnishing blanks, stationery, and instruments when desired, and authorizing free distribution of Signal Service forecasts to a large number of observers designated by the directors. This liberal policy which the Chief Signal Officer has pursued towards the local and State services has been courteously acknowledged by the officials of the local services, and the assistance which has been rendered by the national service to these services has contributed largely to their success.

H. H. C. DUNWOODY,

Captain Fourth Artillery, Signal Officer, in charge of State Weather Services.

STATES IN WHICH LOCAL WEATHER SERVICES ARE NOW IN OPERATION, WITH THE NAMES OF DIRECTORS AND SIGNAL SERVICE ASSISTANTS.

State.	Central station.	Director.	Signal Service assistant.
Alabama	Auburn	Prof. P. H. Mell, Agricultural and Mechanical College.	J. M. Quarles.
Arkansas	Little Rock	Mr. M. F. Locke, Commissioner of State Bureau of Agriculture.	W. U. Simons.
Colorado	Colorado Springs	Prof. F. H. Loud, Colorado College Observatory.	W. S. Miller.
Illinois	Springfield	....	John Craig (in charge).
Indiana	Indianapolis	Prof. H. A. Huston, Purdue University.	C. F. R. Wappenhans.
Iowa	Des Moines	Mr. J. R. Sage	G. M. Chappel.
Kansas	Topeka	Prof. J. T. Lovewell, Washburn College.	T. B. Jennings.
Kentucky	Louisville	Dr. E. A. Grant, Treasurer Polytechnic Society of Kentucky.	Frank Burke.
Louisiana	New Orleans	Under the auspices of the Commercial and Agricultural Associations of Louisiana.	R. E. Kerkam (in charge).
Michigan	Lansing	N. B. Conger, Observer, Signal Corps.	
Minnesota	St. Paul	....	John Healy (in charge).
Mississippi	University	Prof. R. B. Fulton, University of Mississippi.	
Missouri	Columbia	Mr. Levi Chubbuck, Secretary Missouri State Board of Agriculture.	A. L. McRae.
Nebraska	Crete	Prof. Goodwin D. Swezey, Doane College.	G. A. Loveland.
Nevada	Carson City	Prof. Charles W. Friend, State Geologist.	H. E. Wilkinson.
New England Meteorological Society.	Cambridge	Prof. W. M. Davis, Harvard College.	J. Warren Smith.
New Jersey	New Brunswick	....	E. W. McGann (in charge).*
New York	Ithaca	Prof. E. A. Fuertes, Cornell University.	I. G. Gardiner.
North Carolina	Raleigh	Dr. Herbert Battle, State Agricultural Department.	C. F. von Herrmann.
Ohio	Columbus	Prof. B. F. Thomas, State University.	C. M. Strong.
Oregon	Portland	Mr. H. E. Hayes, Master of State Grange.	B. S. Pague.
Pennsylvania	Philadelphia	Under direction of Franklin Institute.	T. F. Townsend (in charge).
South Carolina	Columbia	Hon. A. P. Butler, Commissioner of Agriculture.	G. E. Hunt.
South Dakota	Huron	....	S. W. Glenn (in charge).
Tennessee	Nashville	J. D. Plunkett, M. D., President State Board of Health.	H. C. Bate.
Texas	Galveston	Mr. D. D. Bryan	I. M. Cline.

* Since the death of Professor Cook, in New Jersey, assistant has remained in charge.

ALABAMA.

No annual report has been received from the Alabama State weather service. As a sample of the meteorological data collected and published by that service, the following bulletin is given:

Report of the Alabama Weather Service, coöperating with the U. S. Signal Service, June, 1890.

STATE SUMMARY.

Atmospheric pressure (in inches). Monthly mean, 30.065; maximum observed, 30.296, at Auburn, on the 10th; minimum observed, 29.776, at Auburn, on the 30th; range for the State, .520.

Temperature (degrees): Monthly mean, 79; highest monthly mean, 83.3, at Goodwater; lowest monthly mean, 72.8, at Chepultepec; maximum, 99, at Gadsden, on the 30th; minimum, 50.5, at Jasper, on the 5th; range for the State, 48.5; greatest local monthly range, 43, at Jasper; least local monthly range, 17, at Chepultepec.

Precipitation (in inches): Average for the State, 3.32; greatest, 5.92, at Uniontown; least, 1.46, at Guntersville.

Wind: Prevailing wind, southeast.

There were but few characteristic features during this month that call for special attention except that it was hot and dry. Attention, however, is directed to notes from observers.

This season was very warm, the average temperature being above the normal. The rainfall over the State was light, being considerably below the normal. Crops, especially corn, have suffered very much for rain, but cotton did unusually well during the month and is reported in fine condition.

The atmospheric pressure was about the normal, and no very destructive storms have been reported to this office.

P. H. MELL,
Director.
J. M. QUARLES,
Private, Signal Corps, Assistant.

ARKANSAS.

LITTLE ROCK, ARK., *July* 1, 1890.

SIR: The work of the service has been somewhat restricted during the past year for lack of funds to pay for the printing of reports and bulletins. Prof. John C. Branner, the director at the close of last year, resigned and requested the governor to appoint Col. M. F. Locke, commissioner of the State bureau of agriculture, mining, and manufacturing, in the belief that the bureau would be able to print the reports from the appropriation for it. On investigation it was found that the law could not be so construed, and, as the observer and assistant found that he could not spare the time from other duties to solicit advertisements to sustain it, the Monthly Weather Review was discontinued during the entire year, but lately the observer has arranged to have the reports and bulletins printed in the Forest and Farm, a paper devoted to the development of the State, and the May record has already been issued in this paper.

The work has not advanced as much as could have been hoped for it for want of such an organ of publication. Forecasts have been sent by telegraph to an average of 14 stations during the year. Flags have been purchased at 9 of those places, and at others old ones have been used. The forecasts are also telephoned free of cost to five points in the State. The haymakers in the prairie counties and the fruit growers in all portions of the State pay particular attention to the forecasts as telegraphed out, also the wine growers, several of whom have their addresses at the local office and ask to be informed by telegraph, at their own expense, of any indications of late frosts in spring, so as to enable them to protect their vineyards by filling them with smoke made from pine-wood fires covered with sand after they are burning well.

Full reports from instruments have been received by mail, monthly, from about 26 stations in the State, and weekly reports of the weather and its effect on crops, with the condition of the crops, are received from nearly every county in the State.

The weekly crop-bulletin has been issued from April 1 to December 1, and it is sent to 366 addresses, in the State and out of it, and almost every week letters are received from persons asking to be sent the crop report. Many of these requests are received from out of the State, mostly from the Southern States east of Arkansas. This seems to be the most sought after of all the reports published.

The old observers have, in some instances, ceased to make reports, but in most of such cases they have recommended some one else to take their place, and I am glad to say that, in most cases, these have given satisfaction. Some arrangement should be made by which a competent person could be sent to a number of places in the State to secure reliable observers, as it is very difficult to find observers by simply writing to persons at a distance, while good observers could be obtained in almost any town if it were visited by some one interested in the work.

There has been no assistance rendered to the service by the State, but it is hoped and expected that at the next session of the legislature, which will be in January, either a bill to provide for a State service will be passed or a clause inserted in the bill for the agricultural bureau, by which the weather service will be allowed to receive financial assistance from that department of the State government.

The work of the service has been done by the observer at this station in addition to his other duties, and he has not been able to devote that amount of time to it which is necessary to increase its efficiency, and he should be allowed more help for this purpose if it can possibly be done. Professor Branner says that it was promised him that another assistant would be allowed at this station to permit the observer to give more attention to the State service, but none has been sent yet.

The benefits of the service are fully known to but a small percentage of the people of the State, but where they are fully or in part known they are highly appreciated and taken advantage of in numerous ways. The Monthly Weather Review is regarded as a publication to be implicitly relied on as a record of the weather and as a guide for future years.

M. F. LOCKE,
Director.
W. U. SIMONS,
Sergeant, Signal Corps, Assistant.

CALIFORNIA.

A weekly weather-crop bulletin service has been organized in California, and the following is a sample bulletin:

WEEKLY CROP BULLETIN.

SACRAMENTO, CAL., *August* 23, 1890.

Upper Lake.—C. H. Hammond: Grapes doing well, and will be a large crop for the small acreage here.

Lander.—W. M. Baker: First car load of Bartlett pears and other fruits being shipped east yesterday, the 22d.

Orangevale.—J. W. Anderson: Picking late peaches; crop very good. Oranges doing well; figs and prunes above the average.

Lodi.—Ezra Fiske: The grain harvest is done; yield about half the average crop. Grapes ripening; prospects for a full crop.

Denverton.—S. K. Nurse: Warehouse receipts for northern Solano county and the Montezuma hills indicate less than half a crop of grain.

Napa City.—William H. Martin: Weather favorable for the grain and fruit crops. Potatoes doing well. Still shipping fruit east.

Santa Rosa.—C. C. Farmer: Fruit crop turning out much better than expected. Peaches all gathered. Prunes look fine.

Chino—John Wasson: The temperature and sunshine during the past week have a decided effect upon the curing and ripening of the deciduous fruit crop.

JAMES A. BARWICK,
Sergeant, Signal Corps, Observer.

[Circular letter to the crop correspondents of California.]

SACRAMENTO, CAL., *August* 23, 1890.

To the VOLUNTARY CROP OBSERVERS:

GENTLEMEN: As the crops are about all harvested, and a great many of the observers have ceased sending their crop reports, I deem it advisable to bring the weekly crop bulletin to a close for the present season; and in doing so allow the Chief Signal Officer, General A. W. Greely, through me, to thank you very kindly for the promptness with which you have rendered your reports, and hope that you will assist next year in getting an earlier start on the weekly crop reports, thereby benefiting the State earlier in the season than we did the present one.

Very respectfully, your obedient servant,

JAMES A. BARWICK,
Sergeant, Signal Corps, Observer.

COLORADO.

COLORADO SPRINGS, COLO., *July* 9, 1890.

GENERAL: I have the honor to submit the usual annual statement of the work of the Colorado weather service. The inclosed report of Sergeant Miller embraces full statistical details, and little if anything else is needed on my part, except to give an account of the relation sustained by the service to the State government. On July 1, 1889, the act of the previous legislature took effect, by which the State weather service was organized under the supervision of the board of agriculture, and $1,000 per annum appropriated for its expenses. Not long after, the legislature having dissolved, a question of legality was raised respecting the appropriation bills in general, and all were submitted to the state supreme court and a class of appropriations including that for the weather service was disallowed. We are at present, therefore, as before this year, without State financial support, though we have gained State recognition, which it is hoped may be renewed with better effect at the next legislative session convening January, 1891.

Very respectfully,

F. H. LOUD,
Director Colorado State Weather Service.

[Inclosure No. 1.]

COLORADO SPRINGS, COLO., *July* 1, 1890.

SIR: I have the honor to submit herewith the report and papers required by paragraph 4 "general instructions relative to the coöperation of the Signal Service with State weather services." Your letter of June 9, 1890, relative to reporting the date of planting and harvesting the principal crops of the State, was not handed me until the 20th of June, so that there was no time to collect this data before the close of the year in time for this report. I have written to the State Board of Agriculture for the information, in general, and as soon as it is received here will forward same to your office.

Sergeant W. T. Sherwood was relieved from duty with the Colorado service on October 18, 1889, by myself.

Inclosed herewith are the following papers, viz:

Inclosure 1.—List of stations, arranged by counties alphabetically, giving the names of observers, with kind of instruments at station, by whom owned, and kind of report received from each office.

Inclosure 2.—Alphabetical list of stations with names of observers, which may perhaps be convenient for use at the Office Chief Signal Officer, as it gives a corrected list of stations and names for the "Weather Review" at the end of each quarter.

Inclosure 3.—List of persons, with post office address, receiving the "Monthly Weather Review." As is noted thereon, there are 6 persons now receiving the "Review" not entitled thereto. There are some 40 of these rainfall observers, and shortly the number will be nearer 60 as I have still a number of Geological Survey gauges to place, furnishing data with very fair regularity and much care, and it is respectfully recommended that the "Review" sent to the six persons above referred to be discontinued, and about 15 copies of the publication be sent this office to be mailed by me to 15 of this class of observers, they to return them to this office when they will be sent to a second 15, etc., until all have had the benefit thereof. This would be a good use to make of the additional "Reviews" and I hope they can be spared for this purpose, as the observers do work that is especially valuable in direct connection with investigations now being pursued by various departments.

Weather signals are displayed in the State as follows:

Bethel & Elliott, Greeley; The Mayor, Julesburg; Captain S. C. Aldrich, Monte Vista.

Very respectfully, your obedient servant,

W. S. MILLER,
Sergeant, Signal Corps.

[Inclosure No. 2.]

Dates of planting and harvesting principal crops in Colorado.

Spring wheat is sown in northern Colorado from February 15 to April 1; in southern Colorado from February 1 to April 1; harvest in August.

Oats are sown during March and April and harvested in August.

Corn is planted from the latter part of April to the 15th of May and harvested in early September.

Potatoes are planted any time during May and harvested in October.

Spring rye is sown in March and harvested late in July or early in August.

Winter rye is sown from July 1 to end of September and harvested the succeeding June or July.

Millet is sown from May 25 to June 15 and harvested in September.

ILLINOIS.

SPRINGFIELD, ILL., *July* 3, 1890.

SIR: In compliance with instructions received, I have the honor to make the following report relative to the Illinois weather service for the year ending June 30, 1890:

But little change has been made in the work of this service during the past year. Reports have been received on an average from about 40 voluntary observers. Forms 184-C and 122-I, made up from these reports, have been forwarded to Washington on the 15th of each month.

Beginning December, 1889, having been authorized, I commenced issuing a monthly report, cyclostyled, for distribution among the observers reporting, and to the various State weather centers. (Copy of form inclosed, marked A.) A summary of the report is also issued to the newspapers throughout the State. The crop bulletins have been issued regularly during the growing season, 200 of which are published weekly and distributed to the observers and the principal newspapers throughout the State. These bulletins are published regularly in full, by the principal newspapers in the State. A summary of the bulletin is also published in the St. Louis Globe-Democrat. This part of the work is greatly appreciated by those interested. The data used in making up these bulletins is furnished by the voluntary observers, reports being received from about 27 counties. Inclosed find copy of bulletin marked B.

The weather forecasts and warnings are telegraphed daily, except Sundays, at the expense of the Government, to the leading points in the State, and as a general thing have been greatly appreciated by the citizens. Inclosed find list of places furnished with forecasts, marked C.

I also inclose herewith a list of observers reporting (inclosure marked D.)

Average dates of planting and harvesting principal crops in Illinois: Wheat planting, September; harvesting about June 15. Oats planting, May 1; harvesting about July 15. Corn planting, May 10; harvesting about November 1.

Very respectfully, your obedient servant,

JOHN CRAIG,
Sergeant, Signal Corps.

INDIANA.

PURDUE UNIVERSITY,
La Fayette, Ind., June 30, 1890.

SIR: I have the honor to report the following in regard to the Indiana weather service:

The service is under the management of the Agricultural experiment station at Purdue University, coöperating with the U. S. Signal Service, and voluntary observers throughout the State. The voluntary reports have been well maintained during the year, and two more barometer and four more anemometer stations have been added. The ratio of stations in the northern part of the State is higher than in previous years.

The service continues to issue a monthly bulletin and a weekly crop report. This report is published by the Indiana Farmer, and is supplied to all newspapers on Mondays. Many papers are publishing this report in part or as a whole, and the material is highly appreciated by those indirectly as well as directly interested in agriculture. In December, 1889, a summary of the temperature and precipitation at as many points in the State as possible was made, using all available records. The summary was found very useful and was highly approved by the Census Department. It is published as a special sheet in the bulletin for December, 1889.

From all sides come expressions of approval of the forecast displays, and these indications are being more and more valued by business men.

The success of the service is very largely due to the prompt and efficient work done by observer C. F. R. Wappenhans, who is detailed to act as assistant. During the year many calls have been made on him for special work outside of the office routine and the special calls have been very promptly met.

I would also acknowledge the valuable services of the voluntary observers who furnish reports both weekly and monthly, as well as summaries of observations in previous years.

To the Chief Signal Officer we are indebted for stationery, instruments, assistants, telegrams, and other aids.

A copy of the bulletin for December, 1889, and the latest monthly and weekly crop bulletins are inclosed.

Very respectfully submitted.

H. A. HUSTON, *Director.*
C. F. R. WAPPENHANS,
Sergeant, Signal Corps, Assistant.

IOWA.

DES MOINES, IOWA, *July* 1, 1890.

SIR: In compliance with your request I have the honor to transmit herewith the first annual report of the Iowa weather and crop service.

The initial steps were taken last year to place Iowa in line with other States in the maintenance of a local service coöperating with the U. S. Signal Service. Under direction of the Chief Signal Officer, Observer George M. Chappel, of the Des Des Moines station, aided by Secretary Shaffer, of the State Agricultural Society, the Des Moines Commercial Exchange, and a number of public-spirited citizens, undertook the collection of weather and crop reports from all parts of the State, so far as practicable; and the substance of these was embodied in weekly bulletins which were published and circulated during the crop season for the benefit of producers and shippers of farm products. This attracted public attention and led to the passage of an act by the twenty-third general assembly establishing the Iowa weather and crop service, the scope and purpose of which are set forth in the following sections of chapter 29, session laws of 1890:

"*Be it enacted by the general assembly of the State of Iowa:*

* * * * * * * * * * *

"SEC. 2. That there be and is established in the State of Iowa, under the supervision of the board of directors of the State Agricultural Society, a weather and crop service, coöperating with the Signal Service of the United States, for the purpose of collecting crop statistics and meteorological data, and more widely disseminating the weather forecasts and storm and frost warnings for the benefit of producers and shippers of perishable products, and to promote a general knowledge of meteorological science and the climatology of the State.

"SEC. 3. That the central station of said weather and crop service shall be in the city of Des Moines, under the charge of a director and an assistant director, the said director to be appointed by the governor for the term of two years upon the recommendation of the said board of directors of the State Agricultural Society; and the assistant director to be an officer of the United States Signal Service who may be detailed for that purpose by the Chief Signal Officer at Washington, District of Columbia.

"SEC. 4. That the said director, coöperating with the secretary of the State Agricultural Society, shall establish volunteer stations throughout the State to the number of one or more to each county, and shall appoint observers thereat. And the said director shall supervise said volunteer stations, receive reports therefrom of meteorological events and crop conditions, tabulate the same for public record, and shall issue weekly weather crop bulletins during the season from April first to October first; and he shall also edit and cause to be published at the office of the State printer a monthly weather and crop review, containing meteorological and agricultural matter of public interest and educational value. And it shall be the duty of the State printer to issue copies of said review to the number of one thousand for distribution from the office of said agricultural society; and the directors of said society may in their discretion cause to be published a larger number of copies, to be delivered to subscribers at a price sufficient to defray the expense of publishing the same, the proceeds to be expended for that purpose only.

"SEC. 5. That the said director shall also compile an annual report, addressed to the governor, to be printed and bound in the office of the State printer, in such manner as the executive council may direct, said report to contain a complete review and summary of the results of the year's labors and observations.

"SEC. 6. That there is hereby appropriated the sum of two thousand and five hundred dollars per year for the period of two years to carry into effect the provisions of this act."

On recommendation of the directors of the State Agricultural Society, in compliance with the terms of the above act, the governor, on June 4, 1890, appointed J. R. Sage director of the new service, and the Chief Signal Officer designated observer George M. Chappel, of the Des Moines signal station, to serve as assistant director.

The work of organization has been prosecuted as far as possible within the limited period since the date on which the act became operative. The number of weather crop voluntary observers reporting weekly during the season is now 130, and additions to the list are being made every week. For the monthly meteorological report full tabulated returns as to pressure, temperature, and precipitation are received from forty stations, in addition to the five signal stations located within this State and contiguous thereto.

In addition, monthly reports as to crop condition, acreage, etc., are received from nearly twelve hundred correspondents, representing every county within the State.

The first issue of the monthly review, in form of a double number, covering April and May, 1890, is herewith transmitted, in which is published a list of persons serving as voluntary observers and crop correspondents.

I also have the honor to inclose a copy of the weather crop bulletin, the regular weekly edition of which now numbers 1,150. Copies of these weekly and monthly publications are mailed to the newspapers of the State, in many of which summaries of the bulletins are published, and in the State Register, a paper of large circulation, they are printed in full every week. This gives a wide dissemination to the important matter therein contained.

The press of this State have very generally spoken in highly appreciative terms of this service, and their generous coöperation is very helpful in the work of organizing and carrying into effect the spirit and intent of the law.

There are fifty-six stations within the State at which daily forecasts are received and the flags of the service are displayed. The director hopes to add to this list within the year.

The director takes this opportunity to express to the Chief Signal Officer his high appreciation of the ability, zeal, and untiring industry of Observer George M. Chappel, to whom the State service is largely indebted for its present degree of efficiency. His labors are altogether too arduous, and if practicable he should be relieved wholly of all routine work of the station and allowed to give his entire time to the State service; or he should be furnished another assistant, competent to assume the clerical duties he is now compelled to perform. In making this suggestion the director is aware that this State is already largely indebted to the Signal Service for numerous favors that are duly appreciated.

It is hoped that, when fully organized, this State coöperating bureau will be able to reciprocate and render to the national service at least a partial equivalent for the many benefits received.

I have the honor to be, very respectfully, your obedient servant,

J. R. SAGE,
Director.
G. M. CHAPPEL,
Sergeant, Signal Corps, Assistant.

KANSAS.

WASHBURN COLLEGE,
Topeka, Kans., July 1, 1890.

SIR: I have the honor to submit the inclosed report of the Kansas weather service for the past year.

During the past year the weather service of Kansas has continued its work on substantially the same basis as indicated in former reports. The coöperation of observers is voluntary in all cases, while the field and office work, the compilation of reports and construction of precipitation charts has been mainly in charge of my assistant, Sergt. T. B. Jennings, of the Signal Corps.

The State board of agriculture has included our meteorological summaries in its monthly crop bulletin and in the quarterly and biennial reports. Independent of these publications the weather service has issued a weekly weather crop bulletin in cyclostyle print accompanied by precipitation charts. These have been distributed as widely as possible among the observers, the newspapers of the State, and others interested in the work.

A larger precipitation chart is issued monthly in connection with the reports of the State board of agriculture. These graphic presentations of important phenomena are highly appreciated by those who receive them.

The central office of the service, at Washburn College, Topeka, has an advantage not only in being at the State capital, but in having available the scientific apparatus of the college and the counsel and coöperation of its faculty.

During the year 12,500 of the weekly bulletins were issued and 60,000 of the monthly. The former were also widely copied into the newspapers.

We have at present 98 operating observing stations, 14 having been discontinued during the year, through the death or removal of observers, and 15 new stations have been added. About 15 more will soon be put in operation, thus giving nearly all the counties in the State a representation in the service.

There is yet much to be desired in consolidating the meteorological work of the State. The State Horticultural Society and State board of health have each great need of knowing the climatic conditions of the State and are not as yet in vital coöperation with the State service. This will, doubtless, come when the work is recognized by the State legislature and given a legal status and supported by adequate appropriations.

As it now stands the State weather service helps to bring to the public appreciation the wider work of the U. S. Signal Service and to distribute the forecasts sent out from Washington.

These indications are gradually proving their value and increasing in accuracy and will be more serviceable as they are better known and understood.

The Rock Island Railroad system in Kansas has to some extent introduced weather signals on its moving trains and we believe with considerable success. Doubtless the coöperation of all our railway lines would contribute much to show the progress of storms and also to give warning of their approach. We have found a ready appreciation of our work among railway officials, and think that a union of effort may soon be effected.

This report would be incomplete without a word of commendation of the many excellent observers who have contributed so much to build up our weather service. Inspired by a love of scientific inquiry, they have continued their observations from month to month with unflagging zeal, many of them never failing to send the reports in time, and all showing marked improvement in accuracy and fullness.

Very respectfully,

J. T. LOVEWELL,
Director.
T. B. JENNINGS,
Sergeant, Signal Corps, Assistant.

KENTUCKY.

LOUISVILLE, KY., *July* 1, 1890.

SIR: The director of the Kentucky weather service reports that there are now nineteen voluntary observers who report to this office with commendable regularity, and are manifesting increased interest and accuracy in the work.

Frost-warning flags were distributed to about 100 stations, and warnings were sent to the displaymen; in addition to which, these warnings were sent by telegraph, telephone, and special messengers to about 150 other places. These warnings were highly appreciated, and were the means of saving large quantities of tobacco. In but one neighborhood did frost fail to appear as predicted, and some tobacco was cut before maturing, thereby causing a loss to planters which they are slow to forgive. In other places the planters and traders are enthusiastic in praise of the warnings given. About 75 letters have been received expressing the high appreciation of the service entertained by the writers, and expressing a hope that the frost warnings would be continued and more widely distributed.

Efforts were made to obtain a State appropriation for the State weather service, but ignorance, prejudice, and parsimony triumphed. In view of the fact that the legislature refused to grant any appropriation, the Polytechnic Society refused longer to publish a weather bulletin at its own expense.

The weekly crop reports are highly appreciated. About 350 copies are now issued every week. Special requests for these reports have been received from the leading tobacco exchanges, boards of trade, and agricultural and commercial papers throughout the country.

A systematic effort is now being made to increase the number of observers and crop reporters. It is very difficult to obtain men of sufficient intelligence and scientific knowledge who will undertake the work of an observer, but it is confidently believed that the right parties will be found in many places. Since the State service was organized instruments have been furnished to about 50 observers, but only about 20 were found competent and faithful, and the instruments have been recalled from all the others. Increased care is now taken before sending out instruments.

The press of the State has almost without exception manifested a great interest in the service, and in a large number of the State papers the crop reports are regularly published.

It is believed that the character of the weather forecasts is better understood than heretofore and more confidence is felt in them. The remarkable prediction of the great atmospheric disturbance and destructive winds on the day preceding the tornado that swept over this city March 27 was the subject of much comment, and led to a higher appreciation of the Signal Service.

Inclosed I have the honor to inclose a list of the voluntary observers now taking daily observations, and also a list of the names of persons receiving the forecasts, etc., June 30.

Respectfully,

E. A. GRANT,
Director Kentucky State Weather Service.
FRANK BURKE,
Sergeant, Signal Corps, Assistant.

LOUISIANA.

NEW ORLEANS, LA., *June* 30, 1890.

SIR: I have the honor to render the following annual report of the work of the Louisiana weather service for the year ending June 30, 1890.

There were 56 stations in operation on June 30, 1889, but owing to a number of sets of instruments having been broken during the year, and the fact that in some of the interior parishes, far removed from railroad and telegraph facilities, where but little interest could be manifested owing to delay in receipt of mails that stations were abandoned, the number of active stations at this date is 49.

There has been a marked improvement in the making of observations during the year, and at date there is no observer on the list who is not qualified to make complete meteorological observations and who does not thoroughly understand the work.

The publication of the monthly reports through the issue of a paper supported by private enterprise has been continued during the year, and the one great advantage in this manner of publication is that the "Louisiana Weather Journal" was issued regularly on the 10th of each month, giving the information contained therein promptly to the public. The monthly issue was 1,500 copies, excluding the copies ordered by the railroads, immigration associations, etc., in advertising the climatology of Louisiana.

The weekly weather crop bulletins are issued during the growing and harvesting seasons, and continue to be very favorably received by the public. Through the courtesy of the several directors of State services this office has been able to furnish the prominent exchanges and commercial bodies of this city with copies of the several weekly weather-crop bulletins issued at the different State weather service headquarters. A suggestion to the New Orleans Cotton Exchange resulted in that body having a special blackboard map prepared, to contain the different State bulletins prominently posted for the benefit of the members, so that all information regarding the cotton and other interests supplied by the services, coöperating with the Signal Service, is kept on file by that exchange and highly valued. In addition to this the city papers publish the several weekly bulletins, giving them a thorough dissemination in this and surrounding States.

Data have been compiled during the year from the State service reports for the immigration edition of newspapers, the agricultural and commercial bodies of the city and State, for railroads in claim cases, and the records have several times been taken to court in connection with signal-service data.

The State service continues the great disseminator of Signal-Service forecasts, daily weather maps, and special river and weather bulletins. Weather maps are displayed by observers of the State service at all towns that can be reached in time to make the maps of benefit to the several communities; weather and temperature flags are displayed at but eight towns in the State, owing to the poor telegraphic facilities, but cold-wave and frost warnings receive a thorough dissemination over the several telegraph and telephone lines, the latter through the courtesy of the manager of the Great Southern Telegraph and Telephone Company. There are a number of planters who receive these warnings direct by telephone, prizing them too highly to run the risk of free service, in which they might be overlooked.

The frost warnings are of very great interest to the sugar interests, and the river news is eagerly sought for by the river men and by the rice men in case of extreme high or low water. The cotton interests are not affected except in case of an early frost (killing), and there is less interest displayed by north Louisiana in the warnings of the Signal Service than by south Louisiana.

The great sugar belt of Louisiana covers a section of the State extending from about the thirty-first parallel southeastward nearly to the Gulf. This strip is from 50 to 75 miles wide and less than 200 miles long. In the northeastern portion of south Louisiana vegetables, strawberries, corn, some cane, and rice are grown. southwest Louisiana is devoting a greater acreage to rice than any other crop, and west and north Louisiana grow cotton and corn.

The flood of the past spring has been disastrous to the cotton interests on lowlands in east Louisiana, and to some sugar plantations in southeast Louisiana. The damage to the cotton is variously estimated at from 25 to 50 per cent. on the overflowed sections, and to sugar cane it will be very slight. Crop conditions generally at this date bespeak an average yield for the State of cane, cotton, and corn, with an increased yield of rice.

The average dates of planting and harvesting are as follows: Cotton, planted March 1 to June 1; harvested from August 15 to January 1. Corn, planted from February 15 to June 1; harvested from September to November. Sugar cane, planted from September to March; harvested from October to January. Vegetables, planted from September to February; harvested from March to July. The above are the chief crops. Cane is planted at any time from September to March, sometimes the seasons carrying it well into March. Cotton and corn are frequently delayed by water (as this year in overflowed districts), and not planted until June. Vegetables are planted mainly in the fall and winter and marketed in spring.

A bill creating a State meteorological bureau and weather service was defeated, owing to no funds in the State treasury to make an appropriation therefor. The bill met with favor on all sides, and the several members of the State legislature who were interviewed on the subject stated that all that could be done to secure its passage would be done; but after the general appropriation bill for the State was passed it was found that there were no funds available, and the State service will continue to be carried on under the auspices of the commercial and agricultural bodies of the State of Louisiana.

The office of the State service continues with the signal office at New Orleans, and the force to do the combined work consists of four signal-service men and a civilian assistant, employed by the Signal Service, at $15 per month. This force is entirely inadequate to perform the work if regulation hours are to be worked. The assistants are young, ambitious men, and manifest a great interest in the work of the combined services. Those on duty at this date are M. J. Wright, jr., P. H. Smith, and E. C. Easton, of the Signal Service, and Mr. R. W. Cockerton, civilian assistant.

Suggestions offered.—A greater degree of accuracy should be attained in the frost and cold-wave warnings, so that more reliance could be placed thereon by the planters and business communities. Another Signal Service assistant should be detailed for this office in addition to the present force. All State services, particularly in the cotton region, should publish the daily rainfalls with their monthly reports, so that cotton men could secure detailed information on this most important adjunct to the growth of the crop.

List of meteorological stations, display stations—weather and temperature, and frost and cold-wave—flood-warning stations, and where maps are posted by observers of the State service, are inclosed herewith.

Very respectfully, your obedient servant,

R. E. KERKAM.
Sergeant, Signal Corps, Director.

MICHIGAN.

[Michigan weather service, under the control of the State board of agriculture, coöperating with the Signal Service, U. S. Army.]

OFFICE OF THE DIRECTOR,
Lansing, Mich., July 1, 1890.

SIR: I have the honor to submit the following annual report of the operation of this service for the year ending June 30, 1890.

At the close of the year there are 92 voluntary observers reporting regularly to this office, and 10 that make irregular reports, and 8 stations of the signal service, making a total of 110 stations now reporting to the central office and whose reports are used in the compilation of the monthly reports of the service. Of this number there have been 7 new counties supplied with instruments during the year, so that now all the counties of the lower peninsula have regular observers appointed, and all but two or three of them making regular monthly reports.

The data which is compiled from these monthly reports of the voluntary observers is now being extensively used by the different business interests of the State, and the weekly report on the crop conditions has gained much in popularity during the year, and is now extensively used by the agricultural interests.

The weather crop bulletin was published until the 27th of September, 1889, when it was discontinued for the season, and resumed again on April 5, 1890, and has been issued each Saturday morning during this season, and is now sent to 400 different persons (list inclosed) in and out of the State.

This bulletin is now carefully watched by the interested classes, and when posted up in the different public places in the State it is carefully studied. The feature of the weekly rainfall chart is without doubt of great importance, as it shows graphically the distribution of the rainfall over the State during the past seven days, and has done much in an educational way to display the varied distribution of rain in this State, and its consequent effects on different cereals.

This bulletin is now an established fact, and is much used in the State by those interested in agricultural pursuits, and is one of the strongest features of the service. This bulletin gives the mean daily temperature for the past seven days, and the departure from the normal as deduced from fifteen years' observations in the different portions of the State, and the highest and lowest temperatures for the week, the average total rainfall, and the rainfall chart, the amount of sunshine, and the results of the weather conditions on the crops during the week, so that with this bulletin and chart before you it is possible to determine the condition of the crops in any section of the State, and the probable outlook. This feature did not at first appear to the farmers, but it is now becoming more generally understood, and a consequent benefit to this class results. The bulletin will be issued until the last Saturday in September, when it will be discontinued for the season.

Weather signals.—The display of weather signals has been continued to about 75 stations during the year, 42 of which were supplied by telephone, and the remainder by special telegram, or by having the messages sent over the wires of the different railroad companies who owned their wires. On January 1 all the stations of the service were transferred to the control of the signal service, and has since continued, with better results, as the reports are now more regularly rendered than heretofore. It was necessary to discontinue 15 stations for noncompliance with the regulations of the service, but as new applications have filled these places, the number has remained about the same until the last week of June, when a circular was issued from this office requesting information relative to the desire to have the display continued and new stations established, and in response there have been 27 new applications for establishing new stations and a discontinuance of 4, a net gain of 23 stations for the week. As has been before stated, but at a time when it was more of an experiment, the new "local rain flag" has been received with great favor by all interested in the general forecasts, and the reports are much better, and a general higher average of correct forecasts are reported to this office. In consequence of the very many local rainfalls in this State during the harvesting season, this flag has been of no little importance to the farmers who use the forecasts in their daily avocations.

Railway weather signals.—This branch of the service has not been extended during the year, and the following roads are still displaying the signals regularly on the sides of the baggage cars of the early trains leaving terminal points: Chicago and Grand Trunk Railway; Detroit, Grand Haven and Milwaukee Railway; Detroit Division, Grand Trunk Railway; Michigan Central, main line and branches, (2); Chicago and West Michigan Railway; Grand Rapids and Indiana Railway; and the Pontiac, Oxford and Port Austin Railway; and to the superintendents of these roads the director wishes to extend his thanks for the very valuable aid they have always extended to this service.

Voluntary observers.—As has been stated in previous reports, the corps of voluntary observers of this service is very efficient, and to them in a great measure belongs the credit of the present high standing of the service in this State. The experiment of making an allowance for the expenses of voluntary observers' stations has proved an undoubted success, and has had a marked effect on the observers, and also on the manner and promptness in which the monthly reports are now rendered to this office. The reports are now nearly all received by the 4th of the month, and are forwarded in good shape, so that they can be more readily computed and proved than heretofore. It also has the effect of stimulating the observers, who see that there is an effort on the part of the director to have their gratuitous work appreciated, although it be but a small trifle each month. There have been fewer withdrawals and resignations during the present year than in the previous ones, and it may be that this fact may account for it in a measure, although the majority of the observers are sufficiently interested in the work to continue it under any circumstances, as has been shown by the number of voluntary observers who have purchased their own standard instruments, where it has been impossible for the service to supply them for the reason that one set had already been issued to the county in which they resided.

The records of the service have been called for in several cases to be used in lawsuits, and many calls for the records of different sections relative to the average rainfall or temperature of the sections, and for individual cases of record as to whether rain occurred on certain dates, in certain towns in the State. These calls have been promptly met with the necessary data, when it was on file at this office, and several letters on file attest to the benefit it has been to the interested parties.

The compilation of the mean monthly temperature charts from data extending over a period of from one to nineteen years is still in progress, and as the work is being very carefully compiled, and then revised by the chief signal officer, it will not be completed until in December this year, when a complete set of temperature and rainfall charts of the State will be finished and published for the use of the general public.

This office is now engaged in arranging all the reports so that they may be reduced to single sheets, and the data extend over the entire period of each station, and these sheets will be bound in book form, so that any call for rainfall or temperature data from any station in the State can be supplied within five minutes after the application is received. This work has occupied most of the spare time during the past six months, and it will take about three months yet to complete the records ready for the binder.

One particular feature of the monthly work of this service was begun in May, and that was the plotting and publishing in the Detroit Free Press the monthly temperature and rainfall charts, accompanied by a short text relative to the particular features of the month. These charts have been published during the last two months, and are as yet an experiment, but as a means of getting the information before the people at an early date to be used in connection with the crops, and as an educational feature relative to the climate of the State, it certainly should meet with unqualified success. These charts are published several days before the monthly report is in press, and it meets the eyes of thousands, where otherwise it would not be seen.

The progress of the service during the year has been satisfactory, and there is no doubt but that it is gaining ground in this State, and the many uses to which the compiled statistics can be put is being realized by all as the work of the service is understood and appreciated.

In closing this report I am requested by the State board of agriculture to express to the Chief Signal Officer their appreciation of the interest he has manifested in the work of the service in this State, and to extend their thanks for the services of the detail made for the purposes of assisting and carrying on the work of the service, and have expressed their approval of the manner in which the work has been pushed by your representative at this station.

Very respectfully, your obedient servant,

N. B. CONGER,
Sergeant, Signal Corps, Director.

The CHIEF SIGNAL OFFICER,
Washington, D. C.

MINNESOTA.

[Minnesota weather service in coöperation with the U. S. Signal Service.]

UNITED STATES SIGNAL SERVICE,
OFFICE OF THE OBSERVER,
St. Paul, Minn., July 10, 1890.

SIR: In compliance with paragraph No. 4 of general instructions to observers of the Signal Corps serving with State weather service, and circular letter from your office on the 9th ultimo, I have the honor to submit the following as the report of this service for the year ending June 30, 1890:

The undersigned continued in charge of the service during the year, and it is operated precisely as it was at the date of last annual report, viz, as a branch of Signal Service work, operated by the aid and coöperation of voluntary meteorological observers and voluntary crop weather correspondents.

The stations at Brainerd and Owatonna were discontinued during the year. The closing of the former was due to sickness of the observer, and the latter was discontinued on account of the removal of the observer to Medford, Minn., where he continued observations.

Three new stations were added during the year, namely, Crookston, Montevideo, and St. Charles. This makes 21 stations from which meteorological reports are received, including the 5 Signal Service stations. There are 45 crop weather reporting stations this season, and from these an average of 33 reports have been received weekly.

On June 30, there were 16 weather signal display stations in Minnesota, and on the same date this office also forwarded weather telegrams to 19 display stations in the Dakotas.

The monthly and weekly reports issued from the central office are duplicated by the cyclostyle process, and a sufficient number of bulletins are made to supply copies to all newspapers desiring to publish the same and to coöperating observers or correspondents and other individuals. The number of weather crop bulletins issued every Saturday is about 75. The bulletins have been printed quite regularly (generally in full) in the St. Paul Pioneer-Press, Globe, and Dispatch, the Minneapolis Tribune (dailies), and the Chicago Orange Judd Farmer (weekly), besides in several county papers of Minnesota. The bulletins contain reliable and useful information in regard to the weather and crops, and the fact that the newspapers devote so much valuable space to them is the best of evidence that they have grown in popularity with business men and citizens generally. Otherwise they would not be published. The newspapers also print the monthly meteorological reports or extracts from them.

The State legislature meets biennially, and as there has been no session of that body since the spring of 1889, of course there has been no legislative action with regard to this service since the last annual report.

The meteorological data collected by this service serves to establish the climate of the State and the counties where the observations are made, and as meteorological observations become more valuable as they are added to year after year the State should provide funds to continue some system of observations and extend the same to every inhabited county in the State. A well organized State system would also be advantageous for the better utilization of the announcements and storm warnings of the national service.

Of the 16 voluntary stations now coöperating 13 have not missed a single report during the year, or in case of new stations since they commenced observations, and the reports which were missed from the other 3 stations were due to sickness or unavoidable absence of the observers. This rare devotion to the performance of gratuitous work for the benefit of the public is highly commendable, and it is gratifying to the observer in charge to have the coöperation of such public spirited citizens.

The tabulated report herewith shows the names of meteorological stations and observers, also the display stations and displaymen, etc.

The inclosure marked A is a list of weather crop stations and correspondents. Inclosure B shows the dates of planting and harvesting of the principal crops raised in Minnesota.

Very respectfully, your obedient servant,

JOHN HEALY,
Corporal, Signal Corps.

The CHIEF SIGNAL OFFICER,
Washington, D. C.

MISSISSIPPI.

UNITED STATES SIGNAL SERVICE,
OFFICE OF THE OBSERVER,
University, Miss., July 7, 1890.

SIR: I have the honor to make the following report of the working of the Mississippi State weather service for the year ending June 30, 1890.

The State weather service has grown steadily in the extent and quality of the work done by the coöperating observers and in the estimate which is placed upon its work by the public.

The list of observers who have rendered reports during the last six months, including cotton-region observers who acted as volunteers during the winter months, numbers 36, and the stations are well distributed over the State. Reports from these, together with those from 4 regular Signal Service stations within or adjacent to the State, and from 8 cotton-region stations during the crop season, are used in making up the monthly bulletin of the State service. The coöperating voluntary observers have shown marked interest in the work, making out their reports with promptness and with commendable accuracy.

The generous assistance of the Chief Signal Officer has supplied many of the stations with self-registering thermometers and rain gauges and has furnished all the forms and stationery needed for the work.

The University of Mississippi has continued to meet the expense of publishing the monthly bulletins.

The weekly weather crop bulletins are furnished directly to over one hundred and fifty newspapers, cotton exchanges, and persons interested in the staple crops of the State. By special request they are sent to the Financial and Commercial Chronicle of New York and to the New York Herald. They are published in the daily newspapers of the commercial centers in this vicinity. The secretary of the Memphis Cotton Exchange voluntarily expressed his thanks for them and says: "I keep them on file in our exchange, where they attract the attention of our members and are very much appreciated."

These weekly bulletins, summarizing every seven days the influence of the weather on the cotton crop and stating its progress, seem to furnish to the public the most satisfactory information regarding its growth. Their publication in the weekly newspapers of the State, which do not generally publish the daily reports of the Signal Service, constitutes about the only available source of information regarding the general condition of the cotton crop for the large majority of producers.

The national weather service has been of incalculable benefit to the people of the Delta region in this State during the past year in foretelling the extent and duration of the high water in the Mississippi River. The daily forecasts have been serviceable to many who are interested in the hay crop and in the shipment of vegetables. The cold-wave warnings are especially valuable to the fruit and vegetable interests.

In this connection it is believed that storm warnings on the Gulf coast of the State could be made of great value to the shipping interests there. The fisheries and lumber shipping give employment to probably over five thousand boatmen, for whose protection these warnings would serve. The property interests involved amount to several millions of dollars.

The planting season for cotton in this State begins the 1st of April and extends to the middle of May. The planting season for corn extends from the 1st of March to the 1st of July. In the northern part of the State the planting season begins about two weeks later than the dates of beginning just mentioned.

The harvesting season for the crops mentioned extends usually from the middle of August to the 1st of November.

The shipping of early fruits and vegetables from the southern part of the State begins about the 1st of March.

Most respectfully, your obedient servant,

R. B. FULTON,
Signal Corps, Director State Weather Service.

The CHIEF SIGNAL OFFICER OF THE ARMY,
Washington, D. C.

MISSOURI.

COLUMBIA, MO., *July* 3, 1890.

SIR: The Missouri State board of agriculture, through its secretary, organized, in coöperation with the Chief Signal Officer, a meteorological department in August, 1889. Through the kindness of the board of curators of the University of the State of Missouri a room in the experiment building, with roof and ground privileges for the exposure of instruments, was obtained for this Department free of cost.

Since September 1, 1889, this office has continued the meteorological and weather-crop reports which had been carried on up to that time by the Signal Service observer at St. Louis, Mo.

The number of meteorological observers has increased during the year from 21 in September, 1889, to 65 in June, 1890. Nearly all of these observers are supplied with maximum and minimum thermometers and rain gauges. Some of the instruments are loaned to the State board of agriculture by the Chief Signal Officer, some belong to the State board of agriculture, and some belong to the individual observers. Besides the instruments at the 6 regular Signal Service stations, there are 1 mercurial and 5 aneroid barometers and 1 anemometer in use in the State.

A monthly meteorological report has been published, at the expense of the board of agriculture, each month.

In addition to supplying a number of stations with instruments the Chief Signal Officer furnishes this bureau with penalty envelopes, blank forms, etc., for all of its stations.

The daily weather forecasts and frost and cold-wave warnings have been furnished at Government expense to forty-nine points in the State during the year. Owing to the poor telegraphic facilities at the central office the work of distributing these telegrams has been performed by the Signal Service observers at St. Louis and Kansas City. In addition to the display of flags, these telegrams have been disseminated in a most satisfactory manner by means of a system of sound signals given by steam whistles. These signals were first used by Prof. T. Berry Smith, of Fayette, Mo., and are now being used at a number of places. The signal code is as follows:

One long and one short: Fair and colder.
One long and two short: Fair and warmer.
Two long and one short: Rain or snow, and colder.
Two long and two short: Rain or snow, and warmer.
One long alone: Fair, stationary temperature.
Two long alone: Rain or snow, and stationary temperature.
One long, one short, and two long: Fair and colder, followed by rain or snow.
One long, two short, and two long: Fair and warmer, followed by rain or snow.
Two long, one short, and one long: Rain or snow, and colder, followed by fair.
Two long, two short, and one long: Rain or snow, and warmer, followed by fair.
Three long: Cold wave.
Four long: Frost, and severe storm.
Long whistles refer to the weather.
Short whistles refer to the temperature.

The weather crop bulletin has been issued Saturday of each week during the crop-growing season, and is proving of great value to the agricultural and other interests of the State. For this bulletin the bureau has 203 correspondents, who report with commendable regularity. The bulletins are printed in full or in part in 105 weekly newspapers of the State and in 12 agricultural newspapers of the country, and are made use of by the three auxiliary newspaper companies. They are also sent to 203 reporters, to 26 State weather services, and to forty individuals, including members of the State board of agriculture, members of the board of curators and professors of the University of the State of Missouri, members of merchants' exchange and railroad officials. On special occasions the bulletins are telegraphed by the associated press to the daily newspapers.

During the year an effort has been made to collect all the meteorological observations ever made in Missouri. The rainfall data so collected has been tabulated and will appear in the annual report of the State board of agriculture for 1890, making about 40 pages of printed figures. It is hoped that the temperature and other records can be published in the next annual report.

AVERAGE DATES OF PLANTING AND HARVESTING CROPS.

Crops.	Date of planting.	Date of harvesting.
Corn	May 1 to 30	September 15 to all winter.
Grasses		July 10.
Oats	March 15 to April 1	July 10.
Wheat	September 15	June 25 to July 5.
Flax	May 15	July 10.
Cotton	May 15 to June 1	Up to frost.
Watermelons	April 1	July 25.

LEVI CHUBBUCK,
Director.
A. L. MCRAE,
Sergeant, Signal Corps, Assistant.

NEBRASKA.

BOSWELL OBSERVATORY,
Crete, Nebr., July 22, 1890.

DEAR SIR: I have the honor to transmit herewith the report of the operations of the Nebraska weather service for the year ending June 30, 1890.

During the past year effort has been directed chiefly to the increase and better distribution of reporting stations. In the early history of this service there were very few stations except in the eastern and southeastern sections of the State; and even until very recently the stations in the western portion have been few and scattered. During the year there has been a more systematic effort to fill these gaps and to cover the State with some uniformity. The number of stations has been increased during the year from 42 to 61, and arrangements are now being made with the Burlington and Missouri Railroad which will add 10 stations along their lines.

A division has been adopted in which the six sections established are very nearly equal in area, and of the 61 stations no section has less than 6.

The importance of thus securing data from all parts of the State will be seen when it is remembered that western Nebraska lies in the so-called arid region and that as yet we are without data to answer the important question whether rainfall in this region is increasing and other similar questions of vital interest to the future of the State.

As yet no attempt has been made to deduce the average rainfall or temperature of the various months for the entire State but only for southeastern Nebraska. Averages are now being prepared, however, which will soon enable us to give these normals for the entire State.

The work of this service in other respects has been much as in previous years. There has been published each month a weather bulletin and crop report compiled from the reports of the voluntary observers, Signal Service stations, and military posts in the State; also, during the growing season, a weekly weather-crop bulletin. There was also published in the annual report of the State board of agriculture a compilation of all available data on the rainfall of Nebraska from 1849 to 1889. The basis of this compilation was furnished by the Chief Signal Officer, which was then revised by the insertion of later data and corrections.

There have been sent out from this office daily, except Sundays, to such post-offices as could be reached in season, the special a. m. forecast of the Chief Signal Officer.

Besides the regular meteorological reports there have also been received from a part of the stations to which the daily forecasts are telegraphed by the Chief Signal Officer reports of the percentage of correct predictions and these have been included in the monthly bulletin.

This service has been supported entirely without assistance from the State. The expenses of publication are borne by Doane College. The instruments are owned for the most part by the observers, although a portion of them are supplied through the Chief Signal Officer.

The accompanying tables will show the stations at present connected with the service, stations displaying flags and the like.

Very truly yours,

GOODWIN D. SWEZEY,
Director Nebraska Weather Service.
G. A. LOVELAND,
Sergeant, Signal Corps, Assistant.

NEVADA.

CARSON CITY, NEV., *July* 1, 1890.

SIR: I have the honor to submit herewith a report upon the operations of the Nevada State weather service for the fiscal year ending June 30, 1890.

Every effort has been made during the year to extend the work and usefulness of the service, that it might benefit every county in the State as well as every branch of industry affected by the climatic conditions.

From data now in hand, and which is being compiled in a form convenient for future reference, it has been ascertained that Nevada, thought by many to be a barren waste and of no value to the agriculturist, has climate suitable for the production of almost every known plant or fruit, as well as a climate congenial to health, while its lands are as fertile as those found within the border of the United States. In Washoe, Carson, Reese River, Mason, and other smaller valleys cereals of all kinds grow luxuriantly, while fruit growing—now on the increase—is and has been for many years a profitable branch of agriculture. In the southern portion of the State, at Rioville, St. Thomas, Collville, and in the adjacent country, the grape, cotton, tobacco, olives, oranges, figs, and lemons thrive with surprising yields. This section of Nevada is adapted for the production of every kind of fruit, but facilities for marketing the products have prevented the farmer from cultivation except for home consumption. There is now a railroad in progress which will pass through or near this valuable country, when the farmer may market his products and the agricultural resources of Nevada will become known as more than a barren waste or a mining country.

In the central and northern portion of the State there are immense bodies of land which could be made productive could water be secured for irrigation. This subject (irrigation) is one of the great drawbacks, not only to Nevada, but to the entire territory west of the Rocky Mountains, and when it has been solved Nevada will be made to blossom as the rose, for there are no more fertile lands anywhere than within her borders. Thousands of acres of land have been irrigated in the past by private enterprise, which has proved that if the millions of gallons of water running waste in the spring of the year could be stored up till nature intended its use, great benefit would result to the entire West. The vast mining wealth of the State has prevented many from engaging in agricultural pursuits, as the temptation to delve in the earth for a sudden fortune has been too great, until within the past few years, when the demonetization of silver has made mining more unprofitable, when many have gone to the plow and harrow as a means of livelihood. But with the demonetization of silver came the closing of many of the smaller mines, and as a consequence farming was unprofitable, as there was no market for the products. From the last annual report of the surveyor-general we learn that the area of the State of Nevada is about 71,737,600 acres, of which 20,000,000 acres are agricultural, 30,000,000 grazing, and 2,000,000 forest lands. Thus we find about 74 per cent. available for the farmer and stock grower; but from the same report we ascertain that only 141,496 acres are under cultivation, which is entirely due to the depreciation in the value of silver and the lack of proper facilities for irrigation. It is the ultimate desire of this service to collect data which will support the opinion that Congress should come to the relief of the Western States in the irrigation problem with well developed plans for its solution.

The sparse and scattered population of Nevada derive but little value from the forecasts issued by the Signal Service, except along the lines of the Central Pacific and Carson and Colorado and Virginia and Truckee Railways, traversing the State across the northern portion and skirting along the western boundary. Reno, Verdi, Virginia City, and Carson City are the only places that have received the forecasts during the past year. Virginia City is in the heart of the great mining region, and but little value to the farmer is secured from the forecasts. Verdi is in the foothills of the Sierra Nevada Mountains, and in a poor location for agriculture. Reno in the Washoe Valley, and Carson City in the Eagle Valley, are, therefore, the only two stations of value to the farming community. In both of these places flags are displayed from prominent places, conveying the information received by the telegraphic forecast to the outlying districts, where the service is much appreciated. In selecting points for these displays the coming autumn I shall endeavor to secure points more advantageous to the agriculturist.

The issuance of the weekly weather crop bulletin has not been commenced in this State for the reason that with such limited railroad facilities the weekly reports from the greater number of our observers could not reach this office in time to be of value. There is but one way of overcoming this difficulty, that of using the telegraph in collecting some of the most important reports. Beginning with next summer I shall endeavor to perfect a plan for carrying on this important work during the growing season.

Since my last report four stations, Elko, Pioche, Belmont, and Austin, have been equipped with Richards's barographs and thermographs, thereby covering the State more fully with instruments from which the air pressure can be determined.

The matter of proper exposure for the thermometers used by the observers of the Nevada weather service has received but a passing notice. It has been impossible to correct this important matter, as it has been my desire to do, on account of the small appropriation at my disposal. I hope to be able to impress upon the coming legislature the importance of having a fixed standard for instrument shelters at all stations, to be procured and owned by the State. As an inspection has never been made of the several stations, I have no knowledge of the manner in which the thermometers are exposed, but I feel confident that it could be improved in many instances.

Should an appropriation be secured for the purpose the coming year it is thought river observations will be commenced at points on the Carson, Reese, Truckee, Humboldt, Virgin, Walker, and other rivers, with a view of ascertaining the annual flow as well as the periods of highest and lowest water. That this is an important matter is manifest when it is known that the greater amount of water in these streams pass down at a season of the year when it can not be utilized for irrigation, and it will also have an important bearing upon the irrigation question, which is receiving much attention in this State at the present time.

The Nevada service now has stations in every county in the State and valuable reports are being received from them. All of these stations, with the exception of 5 on the Central Pacific Railroad, are equipped with Green's maximum and minimum thermometers and Schultzbach's rain gauges. There are now in operation 39 stations, which are divided as follows: Two Signal Service stations, 5 stations of the Central Pacific Railroad, and 32 stations of the Nevada weather service. All of these stations report monthly, on prescribed forms, and the observers perform their services without compensation. The reports received from these stations have been compiled in a convenient form and published in the monthly weather review and annual report of the service.

I have been assisted during the year by a member of the Signal Service, kindly detailed by the Chief Signal Officer. At the date of my last report, Private Henry F. Alciatore was on duty, but was relieved November 14, 1889, on account of ill health, by the present assistant, Corporal Herbert E. Wilkinson. These gentlemen have been invaluable aids in conducting the work of the service. They have been attentive to their duties, which have been onerous and continuous, as well as endeavoring at all times to improve the service as much as possible.

The monthly weather review has been issued regularly between the 15th and 20th of the month following that for which it is the record during the year. The demand for this publication has increased and extracts from it are published in all the leading newspapers of the State.

Respectfully submitted.

CHAS. W. FRIEND,
Director.

H. E. WILKINSON,
Corporal, Signal Corps, Assistant.

NEW ENGLAND METEOROLOGICAL SOCIETY.

[Prof. W. M. Davis, director; J. Warren Smith, private, Signal Corps, assistant.]

The work of the society during the past year has been in general the same as in previous years.

Routine observations of the climatic elements have been continued, monthly reports having been received from 140 to 167 observers in different parts of New England. The number of changes in stations has not been considerable. A list of stations and observers is inclosed showing the position of each station, the kind and number of instruments which each observer has in use, and the data furnished to the society. The summary of the reports is published monthly in a bulletin, in coöperation with Harvard College Observatory, in whose annals the greater number of tables and the annual summary now appear. The advance sheet (which was issued to members and observers during 1889, replacing a page of the bulletin) has been discontinued, as a sufficiently prompt publication of the bulletin has now been secured; but a brief advance sheet is still sent to over eighty newspapers in New England on the 3d of each month in order to place the results of our records in the hands of the public at an early date.

The annual report for 1888 was issued during the year, and the same for 1889 is now in press; it includes, besides the reprint of a number of monthly tables from the bulletins, a set of tables for the year; a review of the year by quarters; a review of the cyclonic storms that traversed New England during 1889, and a chart of stations and annual isotherms. In the same volume of this report there will appear an investigation of the sea breeze in New England, based on observations made by about one hundred volunteer observers in 1887, and discussed by the director, with the assistance of Sergt. L. G. Schultz and Mr. R. De C. Ward, a student in Harvard College; this essay contains a general review of the theory of the sea breeze, as well as an account of its occurrence and penetration on our coast; it is illustrated by a number of local synoptic maps of the breeze. The volume will also contain an essay on the Characteristics of the New England climate, by Prof. Winslow Upton, of Brown University, secretary of the society.

During the greater part of the year the work of the society has been in charge of the director, who on his return to Cambridge in October, 1889, relieved the secretary of this duty. Sergt. L. G. Schultz was assistant to the society until February, 1890, when he resigned to enter the Coast Survey; he was temporarily succeeded by Sergt. J. W. Smith, who in turn was succeeded by Private J. Warren Smith, on April 18, 1890.

The work at present in hand in the office of the society is, first, the preparation of the monthly bulletin; second, the preparation of a weekly crop report issued on Saturday of each week during the open season; third, the reduction of the observations of thunder storms made in 1886 and 1887. The great part of this work is performed by the assistant under the advice of the director. About twelve days each month are given to the bulletin, including in this its preparation from the observers' reports, proof reading, mailing, and the entering of current reports in the annual tables; an edition of 500 copies is now printed, of which about 375 are distributed to members, observers, and exchanges. The crop reports consume one day each week, reports being received from 67 observers distributed as follows: Maine 5; New Hampshire 13; Vermont 7; Massachusetts 27; Rhode Island 3; Connecticut 12. A list of these stations and observers is inclosed. A double sheet abstract of their reports is prepared by cyclostyle copy, and an edition of 190 copies is struck off and sent to correspondents, exchanges, and newspapers. Particular care is taken to prepare this bulletin in proper form for publication by newspapers without re-editing, and as a result the Boston papers and most of those elsewhere in New England print the bulletin bodily. A copy of the last crop report is inclosed as a sample, accompanied by clippings, showing the manner in which the newspapers print the crop bulletin and the advance sheet of the regular bulletin. We are recently in receipt of a letter from the American Press Association, asking that the crop bulletin be furnished them so that they may publish it in their service. And, as they supply a large number of New England daily papers, the publication of the bulletin will be largely extended. The Boston Herald, in a recent article, said: "The weather crop bulletins of the Signal Service and the New England Meteorological Society, working in conjunction, are giving more than the usual amount of satisfaction this year. They are prepared with great care every week and there are a great many competent correspondents throughout New England."

The charting of the thunder-storm observations occupies such part of the month as is not consumed in other ways. A report on these observations may be expected in the annual volume for the coming year.

There are at present 26 stations in this section which regularly receive the daily telegraphic forecasts and display weather and temperature signals. Two of these stations receive the cold-wave warnings only. All generally report a high percentage of verification and state that the public are well satisfied with, and benefited by, the weather forecasts. A list of display stations and display men is appended.

W. M. Davis,
Director.

J. Warren Smith,
Private, Signal Corps, Assistant.

NEW JERSEY.

New Brunswick, N. J., *July* 23, 1890.

Sir: I have the honor to submit herewith the following report of the New Jersey weather service for the year ending June 30, 1890:

At the beginning of the year the number of stations forwarding reports to this office was 39. Of these 4 have been discontinued, mainly owing to the change of the residence of the observers, and 4 new ones have been established, so at the close of the year we have the same number of stations. The observers, with very few exceptions, have forwarded their monthly reports with remarkable regularity, promptness, and accuracy, enabling this office to issue the monthly bulletin on or before the 15th of each month succeeding that of which it is a record. This, considering the nature of the service and the many discouragements received, owing to the failure on the part of the State legislature to provide for its maintenance, is certainly most creditable.

During the crop season, from May 1 to October 10, weather crop bulletins have been regularly issued each week. These bulletins have become an important and prominent feature of the service, and the interest taken in them by the intelligent farmer has greatly increased during the year. Extracts from the bulletin are regularly published by the leading daily papers of the State and the complete bulletin by the weekly papers. The great dailies of New York and Philadelphia also give it space in their columns during the spring and harvest time.

The benefits received by the general public in the remote towns from the display of weather and temperature signals are many and are fully appreciated by the people.

At the request of the Superintendent of the Eleventh Census there was prepared and forwarded a table showing the mean annual temperature and mean annual precipitation determined from observations made at 48 stations, together with the length of each series from which the mean was determined. We have also furnished, at the request of the State board of health, complete annual reports of 12 selected stations of this service.

The third bill presented to the State legislature, which had for its object the establishing of a State weather service, and which was presented early in the session, was passed by the house only to again meet defeat in the senate. Although we were greatly disappointed we were not discouraged, and took immediate steps to present another bill, this time having it introduced in the senate, where it met defeat the week before. To be brief, the bill was passed by both houses, and received the governor's signature on the 19th of June. It provides that one meteorological station shall be established in each county of the State, and furnished with a set of standard instruments, instrument shelter, rain and snow gauge, and also appropriates the sum of $1,000 for the purpose of meeting the actual expenses in carrying out the provisions of the bill.

It is with considerable regret at this time that I can not furnish the Chief Signal Officer with a full list of the directors, as the governor has not yet selected his appointee on the board. As soon as this is done the work of organization and selecting the new stations to be established will be pushed forward as rapidly as possible.

The following is a copy of the bill which was passed by the State legislature at its last session, and approved by Governor Leon Abbett on the 19th of June, 1890:

AN ACT to establish a weather service in New Jersey and to provide for the appointment of a board of directors and president thereof, and appropriating money to pay the actual expenses of the same.

(1) *Be it enacted by the Senate and General Assembly of the State of New Jersey*, That the establishment of a weather service being necessary to secure a complete history of the weather of New Jersey in order to furnish trustworthy material for study of its climate, to acquaint the people of the State with the physical conditions of every locality based upon reliable climatic data, and during the growing season, to furnish reliable information as to the actual condition of the staple crops, thereby greatly benefiting the agricultural, commercial, and municipal interests, there is hereby created, at the agricultural experiment station, New Brunswick, a central weather station.

(2) *And be it enacted*, That the director, the senior chemist, the professor of botany and horticulture, and a fourth person to be appointed by the governor, shall constitute a board of directors, and be duly qualified as like officers of the State.

(3) *And be it enacted*, That the director of the State experiment station is hereby appointed president of the board, who, by and with the advice of the directors, shall establish, if practicable, one volunteer weather station in each county of the State, and furnish the same with a set of standard instruments, instrument shelter, rain and snow gauge, and that said director shall supervise the same; he shall receive reports therefrom and reduce the same to a tabular form, and report the same monthly for publication as the New Jersey weather report, and shall annually make a report to the governor, which shall contain a detailed statement of all expenditures made during the year and a summary of the observations taken at the various stations.

(4) *And be it enacted*, That the president of the board shall print, under contract, copies of each monthly report, and such weekly reports during the growing season as may be deemed advisable, the same to be distributed by the board.

(5) *And be it enacted*, That there is hereby appropriated, for the establishment of said weather stations, the sum of one thousand dollars, or so much thereof as may be necessary, for the purpose of meeting the actual expenses of carrying out the provisions of this act; no part of said sum shall be paid for salaries of any officer or for office rent.

(6) *And be it enacted*, That no money shall be expended except under the order of the president director, by and with the approval of the board.

(7) *And be it enacted*, That this act shall take effect immediately.

Approved June 19, 1890.

Very respectfully, your obedient servant,

E. W. McGANN,
Observer, Signal Service, in Charge.

NEW YORK.

CENTRAL OFFICE OF THE METEOROLOGICAL BUREAU,
Ithaca, N. Y., July 4, 1890.

SIR: In answer to your request of June 9, ultimo, asking information upon the work of this bureau, it gives me pleasure to state that the operations of this bureau during the past year have been directed mainly toward increasing the number, efficiency, and equipment of the stations of this service, and the publication of monthly meteorological reports and the weekly crop bulletin. The number of stations displaying weather indications has also been considerably increased, with results which prove a general appreciation of the value of the predictions.

After the first meeting of the State commissioners in June, 1889, the instruments needed for new stations and for those already established were purchased and tested. The outfit provided for each station consists of a maximum and minimum, and dry and wet bulb thermometers and a rain gauge, with barometers for the few stations at which observations for pressure are desirable.

The total number of stations now established (including the military posts of the State which, through the courtesy of the Surgeon-General, now send reports to this office) is seventy-seven. Their distribution over the State is as follows: In the region of the eastern plateau, 14 stations; on the western plateau, 9 stations; and on the northern or Adirondack plateau, 8 stations. In the region of the Hudson, Champlain, and Mohawk Valleys, 15 stations; in the St. Lawrence Valley, 5 stations; in the great lake region, 12 stations; in the central lake region, 4 stations; and in the maritime or coast region there are 9 stations. A few important localities are as yet unprovided for, owing to the difficulty of obtaining observers in the thinly populated regions where they are wanted, while, on the other hand, it has been necessary to refuse many applications for instruments for localities where additional stations are not needed. In addition to the regularly equipped observatories, about 40 crop correspondents who have been provided with rain gauges make weekly reports on precipitation; thus giving a total of 120 stations at which rainfall measurements are made.. The monthly meteorological reports embodying the usual data on temperature, pressure, rainfall, etc., with charts showing monthly precipitation and temperature values, have been regularly issued during the year; and the numbers which were not issued during 1889 are being brought out as rapidly as possible.

The first annual report of this bureau, giving details as to its organization, results, and plans for the future operations of the service, was issued in April, 1890, in accordance with the laws of the State among the documents published under authority of the legislature of New York.

During the season of 1889 the weekly crop bulletin was published regularly from March 23 to October 5; and the publication was resumed on March 14, 1890. These bulletins are received with great favor by the people and press of the State. The weather indications are now telegraphed to 48 stations, from which they are repeated by telephone to neighboring villages in many cases. There can be no doubt as to the value of weather forecasts to the people of this State. Every station heard from expresses a desire to continue the display of signals in terms so strong and pressing, that, in my opinion, it will be very undesirable to discontinue them at any time of the year. The poverty of many of the crops of New York during the past two years, and the unfavorable outlook for the present year have made our farmers far more interested in the study of meteorology than at any previous time. The office of the commissioners of this bureau is in daily receipt of questions, reports, or specimens of plants, indicating a very lively sense of appreciation of the relations of meteorology to agriculture in our farming communities; and I am very sure that any measure looking to the suppression of the weather telegrams or crop bulletins would be looked upon with great displeasure. A strong proof of this statement may be found by inspecting the contents of the reports made to this office. (See appendices A to G, annual report to the legislature of New York for 1890), which are filled out by our correspondents with great care in nearly every instance. These reports demand much work, constant observation, and diligent inquiry, and are undertaken by our correspondents with apparent willingness and a keen appreciation of their importance in various directions; and they consider this labor as their return or payment for telegrams and other information from which they and the entire country derive great benefit at all times of the year, both directly and indirectly.

The meteorological service of the State of New York feels indebted to the national service for very valuable aid in many directions, and for the uniform courtesy and promptness with which all the business related to its purposes has been transacted by the bureau under the control of the Chief Signal Officer of the United States.

Very respectfully,
E. A. FUERTES,
Director of the Meteorological Bureau of the State of New York.
I. G. GARDINER,
Corporal Signal Corps, Assistant.

THE CHIEF SIGNAL OFFICER OF THE ARMY,
Washington, D. C.

NORTH CAROLINA.

[North Carolina Agricultural Experiment Station and State weather service, office of director.]

RALEIGH, N. C., *July* 6, 1890.

SIR: In compliance with your request of June 9, 1890, for a report of the work done in connection with the State weather service, I inclose the annual report of the North Carolina weather service for the period ending December 31, 1889. The increased value of the service is evident from the great interest taken in it by our observers and by the public generally. Requests are constantly being received for copies of the publications, especially the weekly weather crop bulletin, and the press of the State heartily coöperates with the service in disseminating information furnished them on crops and various other meteorological subjects. Many papers in this and other States publish the main part of the crop bulletin or extracts from it. The present season has been remarkably favorable for the growth of nearly all crops, and the condition of cotton especially is most excellent and many days in advance of previous years. Tobacco is also improving. The following are the dates of planting and harvesting the staple crops of North Carolina:

Crops.	Average date of planting.	Of harvesting.
Tobacco	Transplanted April 1 to May 10	July to October.*
Cotton	April 1 to 30	August to January.
Corn	April 1	September.
Wheat	October 10	June 1.
Oats	September 10	June 15.
Rye	September 10	June 15.

* Often transplanted as late as June 15.

A copy of the eighth weekly weather crop bulletin containing a special report of the condition of cotton and tobacco June 13, 1890, is inclosed. Five hundred copies of the crop bulletin are mailed weekly from April until October. The number of correspondents has been increased to over one hundred.

From December 31, 1889, to June 30, 1890, but slight changes have taken place in the work of the service. At the end of 1889 the number of observing stations numbered 40, of which the following have been discontinued: Clarkton, Bladen County; observer, S. Meares. Columbia, Tyrrell County; observer, T. J. Jones. Mt. Olive, Wayne County; observer, J. B. Oliver. Lomsburg, Franklin County; observer, T. J. King. Monroe, Union County; observer, D. C. Anderson. Winslow, Harnett County; observer, J. C. Williams. Shelby, Cleveland County; observer, H. E. Frick. Statesville, Iredell County; observer, W. A. Ellieson.

These gentlemen are mostly farmers who have found it impossible to spare the time required to make continuous meteorological observations. It has been decided to endeavor to arouse the interest of the teachers of the State as to the value of meteorological work in training pupils in methods of exact observations, and during the coming year circular letters will be sent to them, on the plan outlined in the report of the Illinois State weather service for 1888 (and report of the Chief Signal Officer, 1888, Appendix 5, page 83). Many of the observers have been very exact, faithful, and conscientious in the performance of their duties, and the people of this State are certainly under obligations to these gentlemen for their earnest support of the State weather service. The reports received from volunteer observers, embracing barometer readings, temperature, rainfall, humidity, direction of the wind, state of the weather, and miscellaneous phenomena, are tabulated at the end of each month and published as bulletins of the North Carolina Experiment Station. Each monthly bulletin contains: (1) a brief summary of the conditions of the weather during the month; (2) tabulated data, including tables of maximum and minimum temperatures, daily mean temperatures, rainfall and comparative data for previous years; (3) graphic charts showing the normal and mean temperature isobars for the month, and the distribution of rainfall. Copies of these reports are sent to the observers of the service, to many newspapers, to other weather services in exchange, and any others making application for them.

The annual report contains: (1) a general account of the work done during the year, with changes in stations, observers, and displaymen; (2) tables of meteorological data to present the climatic conditions of the year in compact form.

The tables given comprise: (1) annual summary for the year by months; (2) annual summary of stations having complete or nearly complete records during the year; (3) showing the mean barometer, highest and lowest for each month of the year at regular signal service stations; (4) showing the mean temperature, maximum and minimum, for each month of the year; (5) gives monthly precipitation and number of rainy days; (6) prevailing wind directions; (7) table of comparisons for previous years; (8) miscellaneous data, such as snows, frosts, local storms, etc.

The expense of printing all reports is borne by the North Carolina Experiment Station, together with office expenses and meteorological instruments supplied to some coöperating observers; otherwise no money is available for the use of the service.

The number of stations displaying weather and temperature signals is now 25. The chief difficulty in maintaining these stations is the expense of procuring flags. The value of the indications is undisputed. In this connection reference is made to the annual report for 1888, pages 6 and 7.

Sergeant H. McP. Baldwin, Signal Corps, was relieved in August, 1889, and C. F. von Herrmann, Signal Corps, detailed as assistant, for whose faithful service the director and the weather service are greatly indebted. The director is also under obligations to the Chief Signal Officer, for his hearty coöperation and assistance in many ways.

Very respectfully,

H. B. Battle,
Director.
C. F. von Herrmann,
Signal Corps, Assistant.

The Chief Signal Officer,
Washington D. C.

OHIO.

Ohio State University,
Columbus, Ohio, August 2, 1890.

Dear Sir: The work of the Ohio meteorological bureau during the past year presents no new features. The number of stations fully equipped and partially has been increased somewhat, and a number of applications for the establishment of stations we have been compelled, for lack of funds, to decline. The number of stations with full equipment now reporting to us is 40. We have 29 rain-gauge stations, 11 of which report maximum and minimum temperatures also.

The work of our observers has been well done, maintaining their well-earned reputation for faithfulness and accuracy.

Thirty-five places are now receiving and displaying weather indications furnished through the bureau. A list of such places and also of observing stations is appended.

Provision for the publication of a weather crop bulletin by this bureau, which we have been trying for three years to secure, seems now assured, so that we may enter on the work next spring.

Very truly, yours,

Benj. F. Thomas,
Director, Ohio Meteorological Bureau.
C. M. Strong,
Corporal, Signal Corps, Assistant.

OREGON.

Oregon Weather Bureau, Central Office,
Portland, Oregon, July 1, 1890.

Sir: I have the honor to submit the following annual report of the operations of this bureau for the fiscal year ending June 30, 1890.

Agreeably to the act of the Oregon legislature, approved February 25, 1890, this bureau has been in operation during the fiscal year ending June 30, 1890.

Hon. H. E. Hayes, Master State Grange, has continued to act as the director, and B. S. Pague, observer, Signal Service, has continued to act as assistant director.

The work of establishing stations has progressed slowly, on account of the limited time that the assistant director has to devote to this bureau. Twenty-eight stations, however, have been established, making over 50 now in good working order. There should be at least 80 stations equipped in the State.

To satisfactorily discharge the duties in connection with the work of this bureau requires the full time of one man, and it is respectfully urged and recommended that the present assistant director be detailed for work in connection with this bureau only, and that he be relieved from duties connected with the regular station.

The State work has suffered owing to lack of time to properly carry out the work outlined. It is hoped that this recommendation may receive immediate action.

The main work through the year was the organization of new stations, collecting, compiling, and publishing the monthly reports (2,000 of which are issued each month, consisting of from 16 to 34 pages of closely printed matter); the issuance, weekly, of the weather crop bulletin; 140 are issued each week, and over 90 newspapers in the State use them. San Francisco and Washington papers, having requested, are furnished with the weekly reports; in addition the Associated and Pacific Press send a condensed report of the weekly crop reports by telegraph to the papers throughout the coast and to the east.

The weekly reports are the interesting feature of this bureau, as they are issued promptly, whereas the monthly reports are fully six weeks late. This could in part be obviated if the assistant director could devote his entire time to the State work.

To bring the service more promptly before the people a series of lectures were made by the assistant director before the farmers' institutes and at fairs.

At the State fair held at Salem, September, 1889, a large display of instruments was made and the assistant director was in constant attendance giving explanations. At the Mechanics' fair held in Portland, September 26 to October 26, a larger display was made. The effect of these two exhibitions was to bring before thousands the practical utility and benefit of the bureau. Many thousands were thus enabled to study the instruments and to have explanations made who had never before seen the instruments. Owing to the lack of instruments similar displays can not be made again.

Inclosure A is a copy of a circular issued to the farmers of the State. Five hundred copies of these were distributed and over 200 replies were received, which, owing to lack of time, have not as yet been fully compiled. Other similar work was projected, but can not be carried out until the entire time of the assistant director can be devoted to the State work only.

Owing to the almost uniformity of the Oregon climate the weather forecasts are not of that general benefit and interest as is the case in other States; however, at a few of the more prominent places the forecasts have been displayed, and have met with the most favorable criticisms. Inclosure B is a list of the places and of the displaymen where these are displayed.

The various newspapers of the State have been uniform in their flattering commendations of the work of this bureau, and prominent men of the State have written in praise of the work of this bureau.

The following are a few extracts:

Heppner Gazette (Morro County): "A valuable work is being done for the State; the reports are invaluable to intending settlers as well as to our own people. The efforts of the bureau will result in much good."

D. I. Asbury, editor News, Canyon City, Grant County: "The reports are of incalculable benefit to the State of Oregon at large. They contain information that can not be gained from any other source."

J. A. Dean, editor Coquille City Herald: "The reports are of incalculable benefit."

Beach & Beach, editors Examiner, Lakeview: "We commend the enterprise shown in giving such exhaustive weather and crop reports."

Chas. Nockell, editor Times, Jacksonville: "The reports are the only ones ever given the public that have possessed any material value to the general public in this State. Numerous readers of the Times have expressed their approval of them."

J. F. Halloran, editor Astorian, Astoria: "The reports are beneficial and of practical value in this direction as affording official and authentic information relative to meteorological advantages afforded residents of this State, *i. e.*, in aiding immigration. The reports are reliable, timely and interesting."

W. A. Wheeler, editor Vindicator, East Portland: "The reports most certainly meet the hearty approval of all agriculturists and are looked upon as being authentic and reliable. They are of vast benefit to all interested in the soil production."

M. D. Abbott, editor Reveille, Baker City: "At no period in the history of Oregon has the farmer of this State, as well as all classes of people, had more need of just such information as the reports furnished. The work of the bureau is a valuable adjunct to the work of the farmer."

W. W. Baker, Portland, editor Rural Spirit and Willamette Farmer: "We are publishing the oldest and most widely circulated agricultural paper in the North Pacific; we publish the reports issued by the State weather bureau. We regard the reports as of the greatest value, and our subscribers throughout regard the reports as of more value than any other aid furnished them by the Government."

Major Ivanhoe, editor Signal, Enterprise: "The reports carry honest and valuable information to the crop raiser, that he can not possibly obtain from personal observation or investigation."

Donald Macleay, president board of trade, Portland: "I have carefully examined the publications of the Oregon State weather bureau, made under your very able supervision, I am greatly pleased with the character and scope of the work and think the bureau is doing good service. There are few things more useful to us or more conducive to our prosperity as a community than full and accurate acquaintance with the climatic conditions that prevail in our State. Nothing but good can result from making the citizens of other parts of the Union acquainted with the advantages which Oregon offers in so mild and equable a climate, with well distributed moisture throughout the year, which insures beneficial crops and perennial fertility. I sincerely trust that the work which you have so ably begun will be carried on and may be, from time to time, extended in its scope in every way practicable."

Capt. J. T. Apperson, member of legislature, member of board of regents State Agricultural College and Oregon Experiment Station, President State Agricultural Society, lately made register United States land office, Oregon City: "The weather bureau is of inestimable value to the farmer and people at large. It was one of the wise measures of the legislature to create the bureau. The reports are interesting and valuable; good work is being done. The bureau deserves the hearty support of the people."

Robt. A. Miller, member of legislature, secretary southern Oregon State board of agriculture, late Democratic candidate for Congress: "I am convinced of the value of the reports as a medium for transmission of valuable information to the agricultural, horticultural, and kindred producing classes; the bureau deserves the support of all the people, especially the producing classes."

M. J. Train, secretary Oregon State Grange, Albany: "Am convinced that the work of the bureau is of value and well worthy of ample support, and that it is constantly growing in favor and appreciation."

Judson Weed, member of legislature, Vernonia: "I am one of the few members of the house who opposed the bill making a State appropriation for the weather bureau. I now look on that action as one of my many mistakes. The information gained from the monthly reports is alone worth the State appropriation. I look on the bureau as being valuable chiefly as an educator. I send the report to friends in the east after reading them myself. They contain information about Oregon that can not be obtained from any other source."

Wm. Armstrong, member legislature, Salem: "I have no hesitancy in saying that in my opinion, the bureau is of great benefit to the people. The amount of information obtained from the reports must necessarily prove of great value to the whole people."

P. Paquet, member of legislature from Oregon City: "I have no hesitancy in saying that, in my opinion, the bureau is of great utility to the citizens of Oregon, and of great benefit to the farmers of the State especially. Some of the topics treated are very interesting and deserve the attention of all thinking men. My sincere wishes for the success of the bureau."

S. P. Mass, member legislature, Paisley: "The reports are a source of very useful knowledge to the old as well as to the young."

H. R. Laughlin, member of legislature, North Yam Hill: "I was not favorably impressed with the weather bureau bill at the last session, and think I voted against its passage, for I thought too much money was being appropriated for a very little good; but since I have seen the character and scope of the work, I must say that I have modified my opinion. I am very much pleased with the reports, for they cover a large field, and have given a large fund of information, more than I thought possible, and I think the continuation of these monthly reports will prove of great value and of incalculable benefit to the people, the farmer in particular."

F. S. Powell, chairman committee of agriculture, late legislature, Monmouth: "I am highly pleased with the reports from the weather bureau, and have no doubt but that they will be of great benefit to the agriculturist."

W. A. Sample, master Grange, Helix: "I believe the reports to be a valuable help to the agriculturist of the State, as well as to all other occupations. All that science and education can do in the way of advancement for the farmer should be done, as the weather bureau is now doing."

G. F. Bonny, farmer, Woodburn: "I have been examining the reports of the weather bureau, and my candid opinion is that they are a most beneficial aid to the agriculturist. The reports should be widely distributed in the east for immigration purposes. I hope the good work of the weather bureau will continue and that its scope of usefulness will be extended in every way possible. The farmer is ruled by the climate and the reports are a valuable help to him."

W. H. Goudy, farmer, Hubbard: "The reports are considered most valuable by the farmers of this section."

Wm. Holder, officer State Grange, Grass Valley: "The reports are filled with information of the utmost importance to the farmers of Oregon as well as to all other classes. The weekly crop weather reports, as published in all of the papers, is more eagerly sought after and read by our people than any other one thing published.

I do not think that the originator of the bill could have foreseen the entire amount of good it will do the people of Oregon, as no one thing ever done by our legislature has given the satisfaction that this weather service has."

E. M. Harriman, farmer, The Dalles: "The reports are of great benefit, especially to the farmers of the State. The prevailing opinion in this section is that the bureau is doing excellent work, and its facilities should be increased."

The following is an extract from the annual address of the worthy master of the Oregon Grange, delivered at the annual meeting held at Salem, May 27-30, 1890:

"I recently received a letter from Prof. B. S. Pague, observer of the United States Signal Service at Portland, giving his observations while visiting our Agricultural College in Corvallis, which I shall submit to the committee on agricultural college, and shall probably call for its reading during the session.

"I requested that a copy of the monthly report of Oregon's weather bureau be sent to every subordinate grange in Oregon, which the professor kindly granted, and the report will be sent to all free of charge upon the request of the grange. They are very interesting, as they contain valuable matter for study and investigation which pertains directly to agriculture, and can be made of immense value if used in our subordinate granges under the head of suggestions for the good of the order."

It is hoped to compile a full report of the meteorological conditions of Oregon, which will form a part of the first report to the Oregon legislature, which will convene in January next. It will require fully four months to do this work and at the same time attend to the regular State work; this is outlined in the expectation that the assistant director will have his entire time to devote to State work.

The Oregon Experiment Station and Agricultural College, located at Corvallis, Oregon, has been fully equipped, with all meteorological instruments. This equipment was desired by the board of regents in order that the experiments in agriculture could be more thoroughly studied by having full climatic reports to consult. The college authorities pay a small salary to one of the students who acts as observer. The college at Forest Grove has also been furnished quite completely with instruments. The State University at Eugene will be fully equipped before September 1.

Considerable delay was caused in establishing stations by James W. Queen & Co., Philadelphia, Pa., who were a long time in filling the order for the instruments, and it was found when they did arrive that some of the measuring sticks were inaccurate, and some of the thermometers in error from 3° to 20°. The barometers were not at all satisfactory, and the sunshine recorders of no account. It should be said for the firm, however, that they made all errors good, but considerable trouble was caused by their shipping these inaccurate instruments 3,000 miles.

The reports of this bureau are mainly used for immigration purposes, although all classes of people call for them and to receive information with regard to the climate in various parts of the State. Frequent requests come from Eastern States for climatic printed matter.

It is hoped to receive an additional appropriation from the next legislature of $2,500, to be used in the purchase of additional instruments, for clerical hire, and also for traveling expenses, as every station in the State should be inspected.

The work of this bureau has started most auspiciously; it has the best of support from the citizens of the State, and its success is almost certain. The service can not be continued as it now is many months longer; *i. e.*, the assistant director giving what time he can from station duties to State work, as it is too laborious, and the latter would suffer from lack of time to give to it.

An additional room, as recommended in the last annual report, has been secured, and it greatly facilitates work. The Oregon notice in the "National crop report" met with hearty favor, furnishing as it did to the eastern resident a weekly authentic report of the crops in this State.

The practical benefits derived from this bureau during the year are: A record of the climatological features of the State; a published statement of the same, which can not but prove to be beneficial in many ways at present as well as in the future; the reports from week to week on the growth and progress of crops, of which has been said, "The crop reports are alone worth ten times the amount appropriated by the State to organize the bureau." In one instance it was brought to my notice that the monthly reports were the means of bringing five families to Oregon. Data has been furnished to agricultural societies, boards of trade, railroads, surveyors, lawyers, merchants, editors, colleges, shipping interests, etc.

Great improvement has been made during the year and a large mass of data collected.

It is hoped to have two or three stations in each county equipped with maximum and minimum thermometers and with rain gauges. Rain gauges will be liberally distributed through the semiarid regions of the eastern part of the State.

Observations of soil temperatures have been made for the past six months at Corvallis, in western Oregon, and at Pendleton, in eastern Oregon. Similar observations in the Great Harney section will, it is hoped, be started at an early date.

The Oregon weather bureau has been the means of agitating the organization of a similar service in the new State of Washington, which will most likely be accomplished in the next few years. It could be done now if the subject were properly presented to the legislature.

This bureau is under obligations to the Chief Signal Officer for the liberal policy he has pursued toward it in the furnishing of blanks, of an additional office room, and in allowing the time of the assistant director to be used in the work of the bureau, as all the work is done by him. Although a general interest in the work of the bureau prevails in the State, yet there is no one who can spare the time without compensation in assisting or directing the work.

Inclosure C is a list of the stations, names of the observers, kind of instruments, to whom they belong, and kind of reports received.

Inclosure D is a list of the crop weather reporters.

Inclosure E gives the average dates of planting and harvesting the principal crops in the State.

All of which is respectfully submitted.

H. E. HAYES,
Master State Grange, Director.
BY B. S. PAGUE,
Sergeant Observer Signal Service, Assistant Director.

The CHIEF SIGNAL OFFICER,
Washington, D. C.

PENNSYLVANIA.

PENNSYLVANIA STATE WEATHER SERVICE,
Philadelphia, July 1, 1890.

SIR: I have the honor to submit the following report relative to the operations of the Pennsylvania State weather service during the year ending June 30, 1890.

The service continues under the same management and has been conducted under the same plan as heretofore.

No changes have been made in the personnel since the service was established under and by virtue of the act of May 13, 1887.

An additional appropriation of $5,000 was granted during the last session of the legislature.

The service fully recognizes and appreciates the substantial aid, liberal policy, and coöperation of the Chief Signal Officer in bringing the service to its present state of efficiency.

A steady advance has been made during the past year in obtaining reliable data and in the increase of reporting stations. Owing to the difficulty of securing competent and reliable observers, there are still some sections in the western portion of the State that are not yet provided for. Some changes in stations and observers have been necessary, but very many of the records are continuous.

Great praise is due those observers who have expended their time and labor in a voluntary service. The accompanying paper, marked A, contains a list of the names of stations, with the names of the observers, from which meteorological reports have been received during the past year. These reports have been tabulated and published in the monthly weather review of the State service, the issue of which is 1,000 copies per month. In addition to this a reissue has been published in the Journal of the Franklin Institute (monthly), and at the end of each year the reports are reproduced and published in the annual report of the secretary of internal affairs of the State of Pennsylvania. These, together with the extracts published by the Chief Signal Officer and by various newspapers, insure that the data obtained shall have an extensive circulation.

Since the establishment of the service all of the available records of temperature and rainfall of Pennsylvania that cover a series of years, some of them going back almost to colonial times, have been collected, collated, and published by the secretary of internal affairs in his annual report of 1888. This preserves many valuable records from probable loss, places them within the reach of all who may wish to use them for reference, and gives due credit to those who have spent much labor and time in a work from which all citizens of the Commonwealth will derive benefit.

In addition to the regular monthly publication of pressure, temperature, and rainfall data, the June weather review of 1888 contained a map of the State, on which is graphically illustrated the unprecedented rainfall of May 30 and 31, which caused the disastrous floods at Johnstown and other portions of the State. Since then each issue of the review has been supplemented by maps showing the normal temperature, the mean temperature, and rainfall for the current month.

The value of the State service was shown in its ability to furnish such complete and reliable data of the rainfall that caused such destruction to life and property.

These records have been freely used in the settlement of claims for damages caused by floods. Records of temperature have been found valuable by the coal interest in determining the effect of changes on the output of coal.

The issue of the weekly weather crop bulletin began during the first week in May, and will be continued until the staple crops are harvested. These reports are recognized as of great interest and value to the public generally and have been largely published by the newspapers throughout the State. Two hundred copies are issued each Saturday evening. A brief telegraphic report of the condition of the crops throughout the State has been regularly furnished the Chief Signal Officer at the end of each week. These form a portion of the weekly bulletin issued from the Chief Signal Office and have been extensively published by the leading papers.

The accompanying paper, marked B, shows the average time of planting and harvesting the staple crops of Pennsylvania, as furnished by the crop correspondents.

The weather signal display stations have been well maintained, with very satisfactory results and with the usual interest. The accompanying paper, marked C, contains the names of the stations and displaymen that were displaying signals at the end of June, 1890.

The average percentage of local verifications of weather and temperature signals as reported by displaymen was: weather, 84 per cent.; temperature, 88 per cent.

Very many sections of the State are reached at an early hour each morning by the newspapers containing the forecasts. The railway bulletin service covers a large extent of territory.

The facilities for obtaining the weather forecasts in Pennsylvania are now so thorough and complete that the areas not provided for are comparatively small.

Few realize the number of persons that are daily furnished with the forecasts and warnings of the Signal Service through the different organizations that are coöperating with that service. Like the many other benefits and privileges to which people become accustomed, their value and advantages are understood and recognized, but because the novelty has worn off their merits cease to be discussed.

Verifications are expected, and the masses are guided by the information furnished them. Comments are heard mostly when the forecasts are not verified. This is the best evidence of the value of the service, and the demand for the information furnished has become almost universal.

The advantages of State services as auxiliaries for the dissemination of weather forecasts and warnings, as well as the collection of climatological data, is now too well understood to need discussion.

The experimental stage has been passed, and, profiting by the experience gained, each State service should soon attain a high standard of excellence. There is no industry that is not more or less effected by atmospheric conditions, and when the permanent conditions of the climate of each section can be closely approximated, proper location can easily be selected that will meet every demand.

While other organizations are working for the general good and solving problems that can only b3 done by coöperation, the State services will perform a conspicuous part in the great work.

Very respectfully, your obedient servant,

T. F. TOWNSEND,
Sergeant Signal Corps.

The CHIEF SIGNAL OFFICER,
Washington City.

Approved:
WM. H. WAHL,
Secretary Committee on Meteorology, Franklin Institute.

SOUTH CAROLINA.

COLUMBIA, S. C., *July* 1, 1890.

SIR: The condition of this service is satisfactory. The farmers generally throughout the State, realizing its great value to our agricultural population, are taking more interest in the operations of the service than at any time since its establishment, and, under different management, the institution is increasing in popularity with the people of the entire State. The service has, however, by no means reached the limit of its efficiency and there is yet more to be done.

We have at present 20 display stations located on the lines of the Western Union wires. This number it is hoped will be increased to 30 as soon as possible, as several important points in the State are still without stations.

During the seeding, growing, and harvest season crop and weather reports have been received from correspondents in every county in the State. During the present crop season, which commenced April 5, these reports have been collated, synopsised, and issued in the form of weekly crop bulletins, which have been extensively circulated, not only through the mails, but their publication has been secured in the leading daily papers of the State. These reports, reflecting as they do the condition of the staple crops grown in South Carolina, have attracted general attention and the edition has been steadily increased to meet the demand from persons living beyond the limits of the State who are interested in our agricultural products.

As stated in the last report, there has been no State legislation in aid of the weather service. What has been accomplished up to this time has been by the Department of Agriculture, which has appropriated and expended about $2,000 in the purchase of instruments, flags, etc. In this sum is not, of course, included the cost of printing, which, as the complete weather reports are published in both the monthly and annual reports of the Department, would amount to a considerable sum.

The State river service inaugurated some time ago is in good working condition. Observers at nine important river points report daily to this office the height of water, speed of current, etc., thus enabling us to forewarn districts subject to overflows of any impending danger.

A. P. BUTLER,
Director.

G. E. HUNT,
Corporal Signal Corps, Assistant.

SOUTH DAKOTA.

HURON, S. DAK., *July* 14, 1890.

SIR: I have the honor to make the following report relative to the North and South Dakota State weather service work during the fiscal year just ended.

The service has been conducted wholly by the observer in charge at this station.

At the suggestion of the observer, Mr. Jno. Cain, State senator for the Huron district, introduced and pressed to passage a bill (senate bill No. 148) establishing a South Dakota meteorological bureau, and the governor was empowered to appoint a director therefor; a section providing an appropriation for the publication of the reports of the bureau was stricken out in joint committee. The appointment of a director has not yet been made, because, the observer is privately informed, the authorities are well satisfied with the manner in which the duties are now discharged; hence the observer is *ex-officio* director.

A monthly summary is issued, as also a complete tabular statement of meteorological observations of several stations. The issue is 150 copies monthly.

The weekly weather crop bulletin is an important, and apparently highly appreciated, feature of the State service work. It is issued each Saturday from March 15 to September 15, and comprises a summary of weather-crop conditions and extracts from remarks by correspondents of the several counties received between the dates covering the issue under consideration. There are about 100 correspondents, and nearly all report regularly each week. The bulletin is published by two daily, three weekly, and two monthly publications issued at Huron; the Sioux Falls Daily Press, and a number of weekly papers throughout South Dakota; also the St. Paul Pioneer Press and Globe, the Minneapolis Journal, and the Chicago Inter-Ocean. The local correspondent is authorized to wire a limited number of words each week to the Pioneer Press and the Minneapolis Journal. It is also in demand in many grain houses in the East as well as to loan and security corporations and flouring and linseed-oil works. It is used by the commissioner of immigration for South Dakota in making up his monthly crop reports, and by the general freight agent of the Chicago and Northwestern Railway Company. The issue is 180 copies weekly.

It is believed the State service is on a much firmer basis than at my last report and the benefit to the public steadily increasing. While one or two of the voluntary observers have evinced lack of interest in the work, the remainder have been zealous and found interest therein. In a few cases press of business has necessitated the transfer of instruments, but this has been done in such manner as to insure, as far as possible, continuity of observations and records.

While there is no doubt of great benefit derived by the public from the daily forecasts furnished to points in both States at Signal Service expense, and the majority of the favored points would not care to see them discontinued, there is reason to believe that in some cases the conditions under which they are furnished are not strictly complied with by the displaymen. Of this, however, I have no personal knowledge, as station duties and the absence of an assistant preclude inspections which might otherwise be made without expense to the Signal Service.

The observer begs to respectfully renew his recommendation of last year, that the present organization, boundaries considered, be continued for South Dakota, and a separate service for North Dakota be established within her boundaries. It is believed, after close observation and careful consideration of the matter, that such action would tend to more liberal legislation for the South Dakota service, and be more satisfactory to the North Dakota people. There is more or less of a feeling, bordering on jealousy, existing between the two sections, and considerable difficulty has been experienced in obtaining crop reporters in North Dakota. There is also in the matter of climate and products a marked difference.

The following is a copy of the bill which was passed by the State legislature of South Dakota, and approved by the governor on March 8, 1890:

A BILL for an act to establish a State meteorological bureau.

Be it enacted by the legislature of the State of South Dakota:

SECTION 1. A State meteorological bureau is hereby created, and the governor is hereby authorized to designate some member of the faculty of the Agricultural College at Brookings to act as director of said bureau, without extra compensation, whenever the Chief Signal Office of the United States shall detail an observer to act as assistant to the director of said bureau.

SEC. 2. The meteorological bureau shall superintend the volunteer weather service now established in the State, and shall appoint such additional volunteer observers and crop reporters as may from time to time be considered necessary. Said bureau shall prepare, from the reports of the volunteer observers, a monthly meteorological summary, and publish the same for free distribution. It shall also prepare and publish weekly, from the fifteenth of March to the 1st of September in each year, for free distribution, a crop bulletin, containing a thorough review of the reports furnished by the reporters of the service.

SEC. 3. Whereas it is necessary that the work of the bureau should be undertaken at an early date in order that it may be of benefit during the crop season of eighteen hundred and ninety, an emergency exists, and it is hereby provided that this act shall take effect from and after its passage and approval.

DATES OF PLANTING AND HARVESTING PRINCIPAL CROPS IN SOUTH DAKOTA.

Crop.	Planting.	Harvesting.
Wheat	March 1 to April 10	July 15 to August 1.
Oats	March 20 to April 20	July 20 to August 10.
Corn	May 1 to 10	September 10 to 30.
Flax	May 1 to June 20	Do.
Millet	May 1 to July 1	September 1 to 30.

This applies more especially to South Dakota; on an average North Dakota plants from five to ten days later.

Very respectfully,

S. W. GLENN,
Sergeant Signal Corps, in charge.

TENNESSEE.

NASHVILLE, TENN., *July* 1, 1890.

DEAR SIR: I have the honor to submit the following report for the year ending June 30, 1890, of the meteorological department of the State board of health:

There have been comparatively few changes in the service in this State since the last report. The number of stations is about the same, yet there is to be noted a general improvement; the number of unbroken records is on the increase, which is a very gratifying fact, as it shows that observers are beginning to appreciate more the importance of having their station records complete as far as their limited facilities will permit.

The lack of standard instruments has been a great obstacle in the way of increasing the number of stations in the State, and as the legislature has continued to withhold financial aid for this special feature of our work, we still depend upon the generosity of the United States service, supplemented by such support as the State board of health is enabled to give out of its meager annual allowance. There is much territory yet uncovered which might be occupied and furnish exceedingly interesting and valuable meteorological data if the proper instruments could be procured. This is especially the case in the eastern division; in the extreme northeastern portion, along the western slope of the Unaka Mountains; in the middle division, along the western edge of the Cumberland Plateau, and on the upper Cumberland; also in the northern and central portions of the western division.

Ten or twelve stations in charge of good voluntary observers in the sections referred to would give, together with the present stations, a sufficient covering of the territory of the State to have very satisfactory results in the collection of meteorological data each month. Correspondence looking to this end has been begun, and it is reasonably certain that before the close of the present year much if not all this territory will be covered if the instruments can be procured.

But those who are willing to undertake this voluntary work are not inclined to assume individually the pecuniary responsibility of instruments, hence it is often difficult to secure the services of a good observer; whereas if the obligation of the State board of health could be substituted instead, no doubt suitable observers could be arranged with at an early date to begin this work at once. I present herewith a list of voluntary stations showing kind of instruments used and blanks employed for reports and other items, marked A, also memoranda of stations established and discontinued during the year, and other items, marked B.

The number of stations where daily forecasts are displayed by flags has decreased since the last report. The cause for this falling off may be either the fact that at many of the places the predictions are received by daily papers and reach a large number of readers, or there is a lack of interest in the signals, and an indisposition on the part of the community to contribute toward the expense of keeping up the flags and properly displaying them. In a few places there are public-spirited citizens who display the signals at their own expense, and these are the stations that are continued.

It has been shown that these predictions are of decided value to the farmer as well as the commercial man and general scientific uses. They have often been the means of saving thousands of dollars to those interested in the production and handling of the crops of the State and the attainment of other important ends. A list of the display stations is herewith presented, marked C.

The publication of the weekly weather-crop bulletin was resumed March 15. Of all the bulletins emanating from the Signal Office or its weather service adjuncts in the various States, this is by far the most important to those interested in the products of the soil, and the growing interest is manifested in the increased demand for it. The weekly edition of the Tennessee weather-crop bulletin goes to the daily press of the State, to a large number of merchants in this and other States, also to the commercial exchanges in most of the large cities throughout the country.

This publication has done more to popularize the Signal Service with all those who are concerned either in the direct production or handling of agricultural products than perhaps any other, certainly in this State, because it brings to them officially each week the latest and most reliable information concerning the growth and maturity and prospects of the various crops of the country. It is not saying too much that the efforts of the Chief Signal Officer in this direction have been attended with the best results, and he has made the service invaluable to the farmer and to the commercial man through the medium of this adjunct to the service. It has been reserved for the weather-crop bulletin to bring directly home to the citizen the practical value of the Signal service, and so long as it is properly maintained, supplementing the daily forecasts, the service will be regarded by the average citizen as one of the greatest blessings under the Government.

Yours, respectfully,

J. D. PLUNKET, M. D.,
Director of the Meteorological Department of the State Board of Health.

H. C. BATE,
Sergeant, Signal Corps, Assistant.

TEXAS.

GALVESTON, TEX., *July* 14, 1890.

SIR: I have the honor to submit the following report of the operation of the Texas weather service for the year ending June 30, 1890. This service is operated with the assistance of the U. S. Signal Service, which has furnished the necessary instruments. The expense for furnishing the reports, etc., is defrayed by the Galveston Cotton Exchange. This service during the year has been under the charge of the sergeant of the Signal Service assigned as assistant to the director, Dr. I. M. Cline, whose general knowledge of the climate of Texas fits him especially for this important work.

There are now in operation in this State 60 voluntary stations, nearly all of which render reports regularly to the central office, Galveston, Tex., where they are carefully checked and corrected and a monthly summary printed. After having extracted the necessary data for this summary the original reports are forwarded to the Chief Signal Officer. Included in the above are 15 cotton-region observers, 10 of whom render voluntary reports of temperature and rainfall during the winter of this year, and all of whom have agreed to render voluntary reports during the winter in future. This gives us an experienced and careful class of observers at the most important agricultural centers of the State throughout the year. The voluntary observers are as a rule willing and competent men, who take an interest in the work and whose services deserve much credit.

During the year the forecasts and cold-wave warnings issued from Washington were distributed from this office to twenty-seven points in Texas. Farmers, stock men, and dealers in perishable goods place a great deal of confidence in these reports, and from information at hand it is plain that a great amount of property is saved annually by these warnings.

A full and complete weather-crop bulletin is issued each week in the year, and is one of the most important and valuable features of the service. It gives information both to the farmer and merchant as to the exact status of the staple crops in the State every seven days, thereby enabling them to formulate their plans in accordance with the prospective crop. It enables the farmer to approximate beforehand the probable price his corn and cotton will bring, and enables the merchant to either cut or increase his orders for goods as the prospects for crops warrant. This bulletin, though seldom containing less than one thousand words, is transmitted in full by telegraph to all the daily papers in the State receiving Associated Press dispatches, and republished by the weekly papers generally over the State. The material part of the bulletin is telegraphed weekly to the Commercial and Financial Chronicle, New York, by their correspondent, and I am informed that it is cabled from there to Europe. The bulletin is mailed to a large number of individuals and firms who deal in the staple products of the State in Texas and in other States. Business men in the eastern cities are requesting that it be mailed to them, in order to get the full text. During the year nearly 10,000 of the weekly bulletins were distributed. The comments made by those interested show that this publication is of immense value to commercial interests, and that its benefits are not confined to Texas, but are felt by business men of other States.

Mr. Runge, president of the Galveston Cotton Exchange, says:

"I consider the Texas Weekly Weather Crop Bulletin a publication of great value to the commercial interests of Texas. It gives each week the temperature and rainfall for the various sections of the State, together with the condition of crops, and I have found by close observation that its statements are accurate. The form and manner in which it is published gives the highest satisfaction to the exchange."

No opportunity will be lost whereby the usefulness of the service may be increased, and it is hoped by arduous efforts to make it a permanent benefit to the State both for climatological and commercial purposes. The data furnished by the observers will be of a great value in determining the climate of the various parts of the State, of which at present very little is known. This data can be used to good advantage for the various scientific purpo-es. Sergeant Cline in now devoting his spare time to tabulating data bearing on the relation which sudden and decided changes in temperature bear to the death rate. He has at his command fifteen years' records of the temperature and deaths in this city, and it is believed that he will be able to make deductions which will be of value to medical meteorology.

Sergeant Cline is commended to the Chief Signal Office for the able and efficient manner in which he has managed this service and for his zeal and interest in the work.

In closing this report I must extend the thanks of the Cotton Exchange and myself to the Chief Signal Officer for the valuable aid and support he has given the Texas weather service.

I am, very respectfully,

D. D. BRYAN,
Director Texas Weather Service.
I. M. CLINE,
Sergeant, Signal Corps, Assistant.

VIRGINIA.

Referring to the incomplete weather service organization in Virginia, the following letter from the observer in charge of the crop bulletin service at Lynchburgh, Va., is submitted:

LYNCHBURGH, VA., *August* 13, 1890.

SIR: I have the honor to state that, in accordance with your approval in letter, dated June 2, 1890, I have furnished copies of the weekly Virginia weather crop bulletin to each of the voluntary observers and correspondents of this State, and to each paper that has agreed to publish the same, until at present it requires 50 copies each week. The bulletin has met with hearty and universal approval; sixteen newspapers, weekly and daily, throughout the State, in addition to the three local papers, now publish the bulletin in whole or in part, while the Richmond Times and Dispatch have it sent to them by telegraph at their expense in order to publish it in their Sunday issues.

The editor of the Lynchburgh Daily Advance, and the correspondent of the Richmond Daily Dispatch, have had some conversation with me in regard to the work of an organized State weather service, and stated that if given accurate information as to the benefits therefrom to be derived by the farmers and business interests, they would begin to advocate the organization of such a service in the State and keep it before the people of the State until the meeting of the next State legislature in January, 1892. (A bill for that purpose failed to pass last winter.)

They desire me to request you to send to this office such information as you may have relative to similar services in other States; how many, and what States have organized State weather services; how they are conducted; the amount of appropriation required and for what purpose in each State; what States in this section do not have them; whether instruments will be supplied to other voluntary observers in this State, in addition to the 15 already appointed and reporting to you; whether an assistant would be allowed to the observer at this station in case a State service should be organized and the central station located at Lynchburgh, with the local observer as director or assistant director; to furnish, if convenient, a copy of a bill for the organization of such a service in this State.

If supplied at earliest convenience with the information requested, I will endeavor to interest as many of the papers of the State as possible in this subject as long as I am at this station, and do all in my power to advance the interests of this service and to benefit the people of this State.

Should a State weather service be organized with an appropriation for printing monthly reports, bulletins, etc., and the work be done at this station, it would of course require the services of an assistant.

Very respectfully, your obedient servant,

J. N. RYKER,
Sergeant, Signal Corps.

[Sample of the Virginia weekly weather crop bulletin.]

VIRGINIA WEATHER-CROP BULLETIN NO. 15.

[Based on reports from voluntary crop correspondents throughout the State, and published by the U. S. Signal Service. For week ending August 29, 1890.]

During the past week the temperature and rainfall have been generally below the average, with less than average sunshine. Light frosts were reported in Bath County on Sunday, but did not cause any damage. In Augusta, Rockingham, and Albemarle Counties rain is badly needed and crops will be cut short. Fodder and tobacco are being secured in good condition in some sections, and other crops are in excellent condition in other sections reported from.

Remarks of special correspondents.

Lynchburgh: Rainfall .29 in two days. Normal rainfall would be about .90 inch. All crops in good condition.

Salem: Rainfall .26 in two days. The season still continues favorable for all growing crops and farm work.

Bedford City: Rainfall .38 in two days. The cloudy weather has somewhat retarded the growth of crops.

Bolar: Rainfall 2.25 on one night. Frost reported in places, but did no damage. Corn and fall pastures looking well. The buckwheat crop looks promising at this time.

Staunton (W. L. Asylum): Rainfall .43 in one day. Drought still continues. Corn and pastures suffering. Vegetation burning up. Feeding required in many localities.

Dale Enterprise: Rainfall .48 in one day. Prospects discouraging for farmers. Wheat less than half crop. Corn crop short. Very little plowing done for fall seeding. Even with the most favorable weather the usual crop will not be seeded.

Yancey's Mills: Rainfall .32 on one day. Grain fields hard and dry. Tobacco poor. Corn fair but short. Gardens good. Rain needed.

Summit: Rainfall above average. Corn and tobacco looking well. Fodder pulling has begun. Pastures in fine condition, and on the whole the country has seldom looked better.

Danville: Rainfall below average. The continued rains will produce a large yield of tobacco, but too much for strictly fine tobacco.

Fall Creek Depot: Rainfall .37 on one day. Tobacco now being cut and cured. The backward portion is maturing finely. Rain needed on high land. Corn promises a good yield.

Mossing Ford: Rainfall .53 in three days. Corn and tobacco show marked improvement since time of excessive rains. Fodder pulling and tobacco cutting commenced, and quality is fine.

Nottoway Courthouse: Rainfall .31 in two days. Corn and tobacco crops are in better condition than for several years past.

Richmond: Rainfall .38 in two days. Conditions favorable to all crops.

Petersburgh: Rainfall .18 in four days. All crops in flourishing condition.

Spottsville: Rainfall 1.40 in four days. Rather too much rain for best development of corn, peanuts, and other crops. Fodder harvest retarded.

Smithfield: Rainfall 1.64 in two days. Crops in southeast Virginia, from Petersburgh to the coast, and from James River to North Carolina, are reported as good as for many years.

J. N. RYKER,
Observer, Lynchburgh, Va.

AUGUST 30, 1890.

APPENDIX 9.

ANNUAL REPORT OF RECORDS DIVISION.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, July 1, 1890.

SIR: I have the honor to submit, in duplicate, the annual report of the records division for the year ending June 30, 1890.

WORK OF THE RECORDS DIVISION.

The records division is charged with the care and preservation of the more purely scientific records of the Signal Service; the examination and verification of such records; the tabulation of the data therein contained for discussion and publication; the preparation of meteorological charts and tables appropriate to inquiries on special subjects; and such other duties as may be involved in a comprehensive arrangement of the meteorological data collected by the Signal Service, with a view of serving the manifold interests affected thereby without loss of time or great expenditure of labor.

As the value of climatic data becomes more widely known, with increased areas of country occupied, so the range of inquiry becomes greater and more extensive year by year, requiring a higher degree of talent for the proper application of observed facts to the questions which come before the office for solution.

A brief recital of the work accomplished during the year follows:

EXAMINATION OF METEOROLOGICAL REPORTS.

The meteorological forms and reports, made by Signal Service observers, are submitted to a searching examination as to their correctness prior to tabulating the monthly or weekly values for discussion and publication in the Monthly Weather Review and other reports. These data going out to the world, subject to scrutinizing review and discussion of scientific investigators, their undoubted accuracy is essential, otherwise Meteorology as a science would suffer seriously if a comparison of data of this Service with that of other parts of the globe would fail to accord with the accepted principles of exact science. Exactness, derived from this close examination, can not fail to attach to this Service much confidence from all interested in this department of scientific inquiry the world over.

This examination, further, is most critical, necessarily so, since it is by such means only that a disposition or tendency to careless and inaccurate work on the part of observers, which seriously affects the value of their observations in forecasting the weather, is detected. Moreover, it is imperatively necessary to secure accurate and reliable data for use in the preparation of climatological charts and tables, and, inasmuch as the Signal Service observations are used as the groundwork for such charts and tables, and frequently to verify meteorological reports from contiguous voluntary stations, the necessity for accurate work becomes obvious.

The original records of observations at all second and third order stations, averaging one hundred and seventy-six forms per month, are verified immediately upon their receipt at the office, and the averages of the several elements thus verified are tabulated and delivered to the Review Division on the morning of the 15th of each month for use in preparing the Weather Review for the preceding month. This work occupies the entire time of the examining force from the 3d to the 14th of each month, and requires considerable skill and constant application in order to insure its completion on the last-named date.

It is worthy of mention that the adoption of a new form of original record and monthly meteorological report combined, which obviates the necessity of a comparison of the two forms, has enabled the Records Division to dispense with the services of two clerks formerly engaged in the comparison of original records and monthly meteorological reports, and to apply their services to the examination of other forms not heretofore examined, thus subserving not only the purposes of economy but enlarging the scope of the matter presented to the scientific world by this Bureau.

Experience has shown the urgent necessity of a rigid examination of each and every meteorological form. The practice of examining only the more important forms, and charging the errors detected therein against the observer making them, has had a tendency to encourage in indifferent observers, careless work on the minor forms which were not examined.

All forms received subsequent to July 1, 1889, and a number of those received during prior years, have been verified and corrected. The list below presents, in detail, the number of forms verified during the year.

Forms 101. Original record of observations (second-order stations)	1,752
Forms 102 and 103. Self-recording anemometer and anemoscope sheets	53,290
Forms 118. Hourly readings, barograph and thermograph	1,187
Forms 119. Original record of observations (third-order stations)	360
Forms 127. Annual meteorological summaries	438
Forms 144. Monthly report of cotton-region observations	966
Forms 165. Hourly wind movement	1,740
Forms 203. Telegraphic cipher reports (estimated)	106,580
Total	166,313

The standard of accuracy in the present corps of observers is high, considering that a much larger number of forms is now examined than heretofore, and the possiblity of error is relatively increased.

The number of errors found in the more important forms for the six months ending June 30, 1889, was 4,612; for the six months ending December 31, 1889, 4,449; and for the past six months, 3,889; thus showing an increase in the efficiency of the observers which must prove gratifying to those who wish to secure for the Signal Service its proper rank as one of the scientific bureaus of the Government and on a parity with the best of them.

As a means of encouragement to skilled and accurate observers, a record of each man's work is kept, and the names of those worthy of commendation are published semiannually; so also the names of those who fall below a certain standard of efficiency are published with a caution to improve their work in the future.

REVIEW TABLES.

Careful attention has been given to the preparation of the meteorological tables which appear in the Monthly Weather Review. The policy of enlarging these tables, especially the table of miscellaneous Signal Service and voluntary reports, inaugurated by the Chief Signal Officer in 1889, has resulted, as was anticipated, in a material saving of labor in the classification and arrangement of temperature and precipitation values in the files of the division, besides furnishing additional data whereby the climatic conditions of the country may be charted with greater precision.

These tables afford an abundance of information touching the climate of the greater portion of the United States. They also present to the student of Meteorology, as applied to many of the economic questions of the day, an invaluable fund of useful statistics. Special attention has been given towards securing complete and reliable returns of excessive rainfall, both by actual observation and by automatic gauges. The record of excessive rainfall for the year, which will be submitted for publication in the Chief Signal Officer's Annual Report, will afford persons who are interested in the rate of fall and frequency of excessive rains an opportunity for study of this class of phenomena in the United States. The record of excessive rains for the year just passed is worthy of more than usual attention, from the fact that it is the first year's record made with a greatly increased corps of observers and under vastly improved conditions of observation. It has been the business of the division to inquire into cases of excessive precipitation whenever there appeared to be any doubt, whatever, as to the correctness of the measurements. In but very few cases has the office been unable to get a satisfactory report.

There has been no delay in delivering the tables to the review division during the year, and but few errors have been made in the work, considering the large amount of data handled and the uncertainty necessarily attached to a portion of it, due to the diversified methods of recording data employed by different observers.

FILING AND BINDING.

Substantial progress has been made during the year towards binding the most important of the Signal Service forms and reports which have accumulated during the past nineteen years. The Signal Service Journal Abstracts, containing much valuable information, particularly as regards the early history of stations, serial numbers of instruments in use, and other matters of interest in connection with the passage of storms, the occurrence of unusual phenomena, etc., have been bound, to include December 31, 1888, in 501 volumes. A very considerable amount of labor was devoted to this work, much more than would naturally be inferred from the mere statement that upwards of 30,000 forms were examined, arranged in chronological order for each station, and prepared for the binder. The stiff, unyielding nature of the paper on which these forms were prepared, and the necessity of removing the paper fasteners and folding anew each form, will account, in a measure, for the obstacles encountered in the work.

The records of storm and cautionary signal displays, up to and including December 31, 1888, were also prepared for the binder during the year. These records are valuable in that they contain an immense amount of data concerning the displays of signals on the Great Lakes and the Atlantic seaboard, the approximate amount of damage done during each month, and the weather conditions which prevailed during each display. These records will, in connection with other available data, serve as a foundation for an investigation, now for the first time convenient, which may be confidently expected to be of great aid in forecasting the approach and force of storms with that degree of certainty which the Signal Service has succeeded in educating the people to demand of its prognostics.

The weekly records of stages of water in the principal rivers were also arranged and bound in 35 volumes during the year. The monthly records of river-gauge readings, beginning in 1881, were prepared for binding, but could not be sent to the bindery, owing to the fact that they were in constant use during the year.

With the work just completed the records for the past eighteen years are, with few exceptions, in such condition that they can be filed in the minimum amount of space and easily obtained when needed.

The original records of observation from 1875 to June 30, 1889 (about 20,000 copies), are still unbound, and while in no immediate danger of destruction from handling, yet, if bound, they could be filed to better advantage and handled much more readily. It is estimated that these records will fill about 900 volumes when bound. The final disposition of these records has been under consideration on several occasions, but as yet no conclusion has been reached. It appears to be unwise to return them to the stations of observations, as has been suggested, until the weekly and monthly forms, covering the period from 1871 to 1881 shall have been compared and corrected to agree with the originals. It has been found that the early records (Forms 4 and 22), while in the main correctly transcribed, contain errors, both in copying and computing, which seriously affect their value in any critical examination of the data contained therein, so that recourse to the original records is frequently necessary in order to obtain correct results. For this reason it is suggested that final action to dispose of these forms be not taken at once.

Below will be found a statement in detail of the forms and reports bound during the year.

BINDING OF RECORDS.

	Vol.
Synopses and Probabilities, January, 1871, to December, 1872	9
Monthly Meteorological Reports, 1888	26
Weather Conditions (fifteen-year temperature and precipitation normals)	2
Annual Meteorological Summaries, 1888	1
Forms 185, Temperature Variability	2
Signal Service Daily Journal Abstracts, November, 1870, to December, 1888	501
Meteorological Summaries at Pacific Railway Stations, 1877-'88	3
State Weather Service Reports, 1888	6
Cautionary and Storm Signal Reports, 1871-'88	135
Weekly River Reports, 1873-'80	35
Annual Report of Stations, 1888	2
Hourly Wind Movement, 1884-'88	18
Monthly Meteorological Reports (third order stations), 1887-'88	3
Monthly Rainfall Reports (rainfall stations), 1887-'88	3
Monthly Meteorological Reports (cotton-region observations), 1883-'88	14
First and Last Frosts	1

THE RECORDS VAULT.

Substantial progress has been made during the year towards perfecting a systematic arrangement of all of the records stored in the fireproof vault. That the entire mass of records has not been classified and arranged is due, not to any lack of diligence or desire, but wholly to a lack of suitable shelving. The temporary wall shelving, constructed in the early part of the year, proved to be insufficient in respect to quantity and, through faulty construction, incapable of supporting the records which have been put upon it. It has been necessary, therefore, to put additional supports between the shelves to prevent them from crushing down one upon another. So long as the present arrangement prevails it will be impossible to rearrange or change the capacity of any single shelf without first removing the contents of the entire section and inserting new supports conforming in length to the new arrangement. It is obvious, therefore, that a final arrangement of the records now on shelving, those remaining in the basement of the War Department building, and those remaining on the floor of the vault can not be made until additional shelving shall have been procured, and the present shelving repaired or new shelving substituted therefor. The records which remain in the War Department building are frequently needed for reference, but can not be stored in the records vault for lack of shelving.

Plans have been prepared and submitted which contemplate fitting up the vault with adjustable metal shelving, which combines the advantages of being fireproof, and at the same time perfectly durable and easily adjusted to new conditions. It is urged that action be taken to fit up the vault with such shelving as soon as practicable.

APPLICATIONS FOR METEOROLOGICAL DATA.

Requests for meteorological data are continually being received from a variety of sources, showing by their number and the range covered by the inquiries, a steady growth in the application of this class of statistics to economic questions, involving many varied operations of agriculture and commerce, and at the same time agreeably testifying to the confidence with which the people have grown to look upon this Bureau as thoroughly capable of supplying information of this sort, which is frequently of imperative economic importance.

Several important and suggestive lines of investigation were opened during the year, among which may be mentioned that tending to show what portions of this country are possessed of conditions of relative humidity, similar to those which obtain in the cotton manufacturing districts of England, the problem being to determine, whether or not, the business of cotton manufacturing could be profitably extended to portions of the United States other than those in which it is now carried on, and if so, what localities are thus available; information of this nature not only adding to the material prosperity of the particular district under discussion but increasing the total wealth of the country by an amount which it is equally beyond the power as it is without the province of this Bureau to measure. The data furnished by the Signal Service, in their bearing upon the matter at issue, were ably discussed by Mr. Edward Atkinson, LL. D., Ph. D., before a meeting of the New England Cotton Manufacturers' Association on October 30, 1889. As significant of the influence of climate on the manufacture of cotton goods, Mr. Atkinson remarks that at Manchester, England, where the art originated, there is no longer a single cotton spindle in operation. All the mills there have been dismantled. All the new mills have been built at points from six to eight hundred feet above sea level at Oldham and other places on the crest of the rise which faces the course of the Gulf Stream. At this point the humidity of the atmosphere is almost constant, the dry winds, which at least accompany, if they do not cause the irregular operation of the machinery which is known to the operatives as a "crazy loom," being from an easterly quarter.

A second and similar line of inquiry, with respect to the conditions of temperature and relative humidity under which flax and hemp production are successfully carried on, was instituted at the request of Hon. R. M. La Follette, member of the Ways and Means Committee of the House of Representatives. These cases, taken from a number of others, show in a general way the possibilities of adding to the wealth and prosperity of a community by a careful study of its climate, the character of its soil, and such other natural facilities as it may possess for the establishment of new and profitable undertakings.

There has been no cessation of inquiries for information and advice upon the climate best suited to relieve certain diseases. While it is not the business of this Bureau to suggest, or advise, residence in any particular climate for the amelioration or cure of diseases, yet it is eminently proper that it should use the accumulated data of years in helping persons in search of a climate for the benefit of their health, to the most reliable climatic data extant. It is true that private enterprise has in some cases formulated treatises upon the beneficial results to be obtained by a sojourn at certain health resorts, but the descriptions of climate in such treatises are not infrequently given from a local rather than a general standpoint, and with a perfectly natural desire to make the best showing possible, regardless of any unfavorable conditions which may obtain.

A great field here may be said to be open for a treatise on health and climate, in which should be pointed out for the benefit especially of the poorer classes, the climates suitable to certain diseases and to which they may be directed at once without expensive cost of travel and resulting loss of time in search of the particular climatic conditions conducive to the restoration of strength to those who, from toil on the farm, in the factory, office, and shop, need speedy and inexpensive relief only derived from a change of atmospheric conditions. In no country in the world is to be found a greater variety of climates with a higher degree of salubrity than this. The bearing of sunshine, pressure, humidity, temperature, and the various elements of weather conditions to health and longevity is a question for the therapeutist rather than the climatologist, but the data for the former is made available by its arrangement in the publications of this Service.

The growing importance of the subject of reclamation of the Arid Region has prompted the call by the House of Representatives for an exhaustive report of the climatology of this great area. It is not anticipating too much from what is already done in the work on this report to say that investigation of the amount and distribution of the rainfall is such and sufficient in many mountain localities to supply water requisite, when gathered in reservoirs, to cultivate a domain of the arid country not inconsiderable in comparison with the whole now under cultivation, and in the past considered as possessing only features of the utmost sterility and unconquerable barrenness. The fact that in some portions of this area two rainy seasons exist, winter and summer, has often been received with great surprise; the publications of this office have, however, established this beyond any question.

An absence of humidity in that region has brought out an explanation of the phenomena that the great extremes of temperature are not felt more than the less extremes in a humid atmosphere. The recurring reports each summer from the central and eastern States, and especially the recent notable mortality in the central valleys from heat and sunstroke, are a source of surprise and wonder to the inhabitants of the Pacific Slope when the quoted temperatures are considered. Almost daily during summer the thermometric record of this Slope, in certain districts, exceeds the very extremes recorded in the east where great mortality has been reported, and yet no serious inconvenience results. The inhabitants of the Atlantic and central sections of the country hear of the extremes of heat reported from the Arid Region often with amazement that it is within the bounds of human endurance, and often indeed with the idea that the reclamation and settlement of that country is visionary, and the assertion that the ordinary vocations of farm and factory are pursued without inconvenience is received with incredulity.

The distinction between the conditions is, that east of the Rocky Mountains—in "the States"—the atmosphere is moist and sultry. A humid air retards radiation of the heat of the body and represses perspiration. West of the range, the atmosphere, cloudless and dry, conserves rapid radiation, induces perspiration which is rapidly evaporated, hence no suffering ensues under the greatest heat, and sunstrokes are quite unknown.

These matters need official verification with explanation, and the importance of the great arid area demands its proper certification as regards its climate and characteristics.

The culture of trees to subserve many purposes is one that is of importance in the investigations of this Service, for it may influence rainfall, if not in increasing or differently distributing it, certainly by holding in the shaded soil more moisture, or shielding it from the dessicating winds. Drought may be retarded by great numbers of well distributed trees. In the great valleys of California the effects of the hot "norther," or "north wind," upon the fields of ripening grain may possibly be materially modified by planting trees in frequent east and west rows, forming between, and especially on their lee sides, forest-protected harbors to the waving surfaces of its grain fields. The towering eucalypts thus thickly planted may be made to break the force of these winds and also raise their flowing currents above the yielding grain stalks which, swaying, knock their heads together, and become greatly thrashed before cut. This destructive wind, first by its dessicating dryness, ripens, and then shells the grain from the heads, often reducing the wheat yield to the value of millions of dollars.

The line of inquiry here presented to the experimentalist in meteorological mechanics is one that may in time prove to the farmer of inestimable value.

The following statement shows in detail the number of certificates, tables, and statements which have been furnished to the public during the year:

Transcripts of Signal Service records authenticated by the honorable Secretary of War	63
Signal Service records produced in court by observers in charge of stations (number of times)	59
Miscellaneous tables and statements, not certified, furnished by this office	327
Miscellaneous tables and statements, not certified, furnished by observers	139
Total	588

METEOROLOGICAL RECORDS IN UNITED STATES BY DECADES.

The present year, 1890, closing a decade, seems a favorable time to institute a census of the progress made in taking meteorological observations throughout the United States during the several decades since 1820, when the first systematic system was inaugurated.

1819–1830.—The first system of regular and continuous observations in the United States was instituted in 1819, at the suggestion of Surgeon-General Lovell of the Army. The instruments used were a thermometer and a wind vane. Observations of temperature were made at 7 a. m. and 9 p. m., and the winds and weather observed morning, noon, and evening.

The results of the observations for 1820 and 1821 were published at the end of each of these years, but a want of uniformity in the tabular arrangement lessens, in a measure, the value of the observations. Those from 1822 to 1825 and 1826 to 1830 were published in separate volumes and later were combined in a single volume.

A local system of meteorological observations was established in the State of New York in 1825 under the supervision of the Board of Regents of the University of New York. The instruments employed were a thermometer and a rain gauge, and tri-daily observations of wind, cloudiness, and weather, in addition to temperature and rainfall, were made.

1831–1840.—A rain gauge was added to the instruments in use at Army posts in 1836. In 1837 the Pennsylvania Legislature appropriated $4,000 for the purpose of establishing a series of meteorological observations in that State. This sum was placed at the joint disposal of a committee of the American Philosophical Society and the Franklin Institute. This system lasted but a few years, and its results were not given to the world in connected form, but, together with many additional and later observations, edited by Lorin Blodget, Esq., will be found in the report of the Secretary of Internal Affairs of Pennsylvania, 1888.

1841–1850.—The results of the observations at Army posts from 1830 to 1842 were published in two volumes, under the direction of Surgeon-General Lawson. At the beginning of 1843 an extension of the system was made by the introduction of new instruments and an additional observation was ordered to be taken.

In 1849 the Legislature of the State of New York made an appropriation which placed the system of observations in that State on a substantial basis. This support was continued until the breaking out of the Civil War. The system was modified, however, in 1850 so as to conform to the directions of the Smithsonian Institution. The results of the observations from 1826 to 1850, inclusive, were published by the State under the direction of the regents of the University.

A State system was also established in Massachusetts in 1849, but the records were not long thereafter presented to the Smithsonian Institution, and have since appeared in its publications.

The most important step yet taken toward awakening an interest on the subject of meteorology was the establishment in 1849 of a system of meteorological observations under the Smithsonian Institution, having, as its principal object, the study of the storms which pass across the United States. This system was continued up to 1874, and accumulated a large amount of valuable material relative to the climate of the country and the character of the storms to which it is subjected. These materials have been collated and discussed in Smithsonian Contributions to Knowledge No. 227, Atmospheric Temperature, published in 1876; No. 268, Winds of the Globe, published in 1875; and No. 353, Precipitation Tables, published in 1881.

1851–1860.—During this decade the results of the observations at Army posts from 1843 to 1855 were published in a quarto volume which also contained consolidated tables of temperature and rain for each separate station from the beginning of observations to 1855. This volume may be considered the most valuable contribution yet made (1855) toward a knowledge of the climatology of the United States.

The results of meteorological observations, made under the direction of the United States Patent Office and Smithsonian Institution from the year 1854 to 1859, inclusive, were completed during this decade and published in 1861. This work appears in two parts, volume 1, relating to statistical meteorology; volume 2, published in 1864, gives observations upon periodical phenomena in plants and animals, with dates of the opening and closing of lakes, rivers, harbors, etc., also materials for a critical study of three storms of 1859. Part III has not yet appeared.

The end of the decade found the country on the eve of Civil War, and as a consequence interest in meteorological subjects rapidly abated.

1861–1870.—The Civil War continued to absorb public attention during the early part of the decade. Very few meteorological records were continued through the years 1861–'65. Even at military posts the meteorological observations were frequently neglected.

The Agricultural Department began to publish a series of meteorological observations in 1863 and continued publishing such observations until 1871, the last year in the monthly reports only.

The Joint Resolution approved February 9, 1870, providing for the taking of meteorological observations at the military stations and other points in the interior of the continent, and for giving notice on the northern lakes and seaboard of the approach and force of storms, stimulated interest in meteorological affairs.

1871–1880.—In 1874 the Signal Service relieved the Smithsonian Institution of the active part it had taken in the collection of climatic data for the United States. At the close of the decade the meteorological observers were distributed as follows:

Signal Service regular observers	249
Medical Department, U. S. Army	77
Voluntary observers	347
Total	673

1881–1890.—During the first half of the decade scarcely any progress was made towards increasing the number of voluntary observers, but for the last half, especially during the past year, the number has multiplied very rapidly, as will be seen from the following statement:

Coöperating voluntary observers of all classes on July 1, 1889	1,679
New observers obtained during the year ending June 30, 1890	668
Resignations, deaths, removals, etc., during the same period	424
Observers reporting on June 30, 1890	1,924
Net gain during the year	245
Gain during the decade	1,577

The distribution of coöperating observers by States and Territories is shown by the following table:

VOLUNTARY AND OTHER COÖPERATING OBSERVERS REPORTING TO THE SIGNAL OFFICE ON JUNE 30, 1889, AND JUNE 30, 1890, RESPECTIVELY.

State.	Voluntary.		State weather service.		Military.		Railroad.		Total.	
	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.
Alabama	10	10	13	14	1	1	......	......	24	25
Arizona	22	33	......	......	9	10	9	9	40	52
Arkansas	1	3	25	22	2	2	......	......	28	27
California	40	45	......	......	8	8	149	154	197	207
Colorado	14	11	32	64	4	3	......	......	50	78
Connecticut	4	5	24	22	1	1	......	......	29	28
Delaware	1	1	......	......	......	......	......	......	1	1
District of Columbia	......	1	......	......	1	1	......	......	1	2
Florida	12	16	......	......	2	2	......	......	14	18
Georgia	13	18	......	......	......	1	......	......	13	19
Idaho	2	10	......	......	2	2	......	......	4	12
Illinois	14	17	......	27	2	2	......	......	16	46
Indiana	12	12	28	20	......	......	......	......	40	32
Indian Territory	5	3	......	......	4	4	......	......	9	7
Iowa	40	44	......	......	......	......	......	......	40	44
Kansas	30	27	65	72	4	3	......	......	99	102
Kentucky	18	17	7	16	2	1	......	......	27	34
Louisiana	9	14	20	29	......	1	......	......	39	44
Maine	5	4	9	11	2	2	......	......	16	17
Maryland	12	13	......	......	1	1	......	......	13	14
Massachusetts	22	22	54	52	2	2	......	......	78	76
Michigan	14	14	74	89	3	3	......	......	91	106
Minnesota	3	6	17	20	1	1	......	......	21	27
Mississippi	10	19	24	25	......	1	......	......	34	45
Missouri	9	45	28	6	1	......	......	......	38	51
Montana	5	7	......	......	7	7	......	......	12	14
Nebraska	24	25	18	23	4	4	......	......	46	52
Nevada	1	......	33	36	......	......	19	18	53	54
New Hampshire	11	11	14	12	......	......	......	......	25	23
New Jersey	7	6	29	29	......	......	......	......	36	35
New Mexico	10	11	......	......	6	6	2	2	18	19

VOLUNTARY AND OTHER COÖPERATING OBSERVERS REPORTING TO THE SIGNAL OFFICE ON JUNE 30, 1889, AND JUNE 30, 1890, RESPECTIVELY—Continued.

State.	Voluntary.		State weather service.		Military.		Railroad.		Total.	
	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.	1889.	1890.
New York	49	46	6	21	12	12			67	79
North Carolina	15	13		9					15	22
North Dakota	22	8		1	5	5			27	14
Ohio	30	27	39	39	1	1			70	67
Oregon	9	16	10	21	1		2	2	22	39
Pennsylvania	30	31	33	56	2	2			65	89
Rhode Island	1	1	9	9	1	1			11	11
South Carolina	4	13	27	14					31	27
South Dakota		20			4	4			4	24
Tennessee	5	8	34	30					39	38
Texas	40	49	16	16	11	12			67	77
Utah	5	16			2	2	6	6	13	24
Vermont	9	6	7	7					16	13
Virginia	13	18			2	2			15	20
Washington	2	5			4	5			6	10
West Virginia	11	9							11	9
Wisconsin	22	20							22	20
Wyoming	2	7			7	6			9	13
Miscellaneous	17	17							17	17
Total	666	800	705	812	121	121	187	191	1,679	1,924

VOLUNTARY OBSERVERS.

There is perhaps no class of observers whose services should be more highly appreciated than those of the voluntary observers of the Signal Service. It is a pleasure to note the fidelity and generousness of so many observers, both men and women, who, month after month, however irksome the duties may be, give their time and attention to recording facts which tend to increase the sum of knowledge and advance the prosperity of the community in which they live. During the year several of the pioneer observers have been obliged, on account of approaching old age, to relinquish what was to them a source of pleasure, a profit to the service, and especially to the community in which they lived.

Among the retiring observers the following have been engaged in keeping a systematic record of the weather for a long period of time, viz: Dr. J. B. Trembly, Oakland, Cal.; Jacob T. Stern, Logan, Iowa; Jos. Dysart, Dysart, Iowa; W. W. Ellsworth, Hartford, Conn.; Geo. Casey, Auburn, N. Y.; Hiram Arents, Oroville, Cal. Of these, Dr. Trembly's record is noteworthy for its completeness and continuity, beginning at Toledo, Ohio, in 1860 and ending in 1890 at Oakland, Cal.

A considerable degree of success has attended the efforts of the division to enlist the interest of individuals in keeping a record of the weather. In some cases, however, valuable reports were allowed to lapse because a person could not be found willing to devote not exceeding five minutes each day to a work which richly pays if properly undertaken.

Now that self-registering thermometers are supplied so freely there will be no necessity for spending over five minutes daily in taking and recording observations. The observations may be made, moreover, at some hour after sunset, preferably at 9 p. m. when the usual daily vocations are laid aside.

An impression seems to prevail, in some minds at least, that the benefits to be derived from a series of local observations, accrue largely and almost wholly to the weather bureau; and, therefore, the weather bureau should pay a small salary for the time spent in taking such observations. This feature of the problem is especially noticeable in the thinly settled portions of our country, where the hardy pioneer is quite apt to look with suspicion upon all processes which do not yield immediate returns for his time and trouble. And, again, the necessity for taking observations at stated times, and frequent absences from home, too often deter even those who realize the value of climatic data from entering upon a work which will eventually prove to be a profitable undertaking.

The idea that meteorological data are intended solely for forecasting the weather is also generally current. Indeed, it is safe to make the assertion that many persons believe the reports furnished by voluntary observers are used in weather forecasting. For the enlightenment of all such it may be said that the reports received from the regular stations of the Signal Service have been considered ample for all forecasting purposes. However, the progress of tentative means and methods in weather prediction, especially that instanced in reporting by telegraph rainfall to cotton-region centers and thence to this office, in certain instances, may prove of so great value as to require an extension, in which case voluntary observers properly located would naturally be selected.

The weather bureau in carrying out the functions devolved upon it by law can, without additional expense, collate and publish climatographic data from all sections of the country. It therefore invites the coöperation of public-spirited citizens in each State or Territory, whose climate is imperfectly known, to discover and make a record of the varying climatic conditions in their several communities, offering them in exchange for their observations like observations from all sections of the country, and the opportunity of making comparisons advantageous or otherwise to their own neighborhood. The benefits which are derived from taking meteorological observations rest principally upon the observer who makes the observations, and the community in which he lives. It is scarcely possible to enumerate here in detail the special value of climatic data as applied to the art of agriculture, medicine, or to commerce.

In agriculture the effect of climate upon cereals and grasses is too well known and acknowledged to bear repetition. It should be the aim of those interested in such pursuits to keep fully informed upon the state of the season, whether forward or backward, with respect to heat or moisture to keep a careful record of the beginning of agricultural operations each season, the first and last killing frosts, the length and severity of the winters, and in other ways to fully determine the especial products best adapted to each particular soil and climate. The stock raiser, too, should acquire a reliable knowledge of the climate in which his interests are placed. The probability of drought or severe winters are matters which vitally affect the success of his undertaking.

The successful cultivation of many of the staple grains depends largely upon the character of soil and the conditions of climate, especially with reference to heat and moisture. Indeed it is possible through an accurate knowledge of the climate and soil of different portions of the globe to introduce the cultivation of plants and grasses at present unknown in this country, and thus add to the material prosperity of the land, simply by a few years of careful observation and an interchange of data with other nations. The foregoing applies with particular force to that great portion of the national domain lying west of the one hundred and second meridian. The southern and southwestern portions of this tract, possessing in a measure a subtropical climate, present an opportunity for investigations with respect to the growth of the mulberry, olive, and the vine. It should be the effort of those who reside in the territory above described to acquaint themselves with the growth of plants and trees indigenous to southern France, Spain, Peru, Chili, and other countries having climates similar to their own.

It is a mistaken conclusion that when the voluntary observer completes his month's observations and mails his report his work is done. The value of his labor lies in the application of observed facts to practical methods, as outlined above, and also in a comparison of observations, made contemporaneously with the culture of different crops, with the crop returns in order to bring out the relations which may subsist between the two factors.

In medicine the services of the meteorological reporter have been appreciated for a number of years. In European countries climatographic data are systematically collated for the use of the health departments. The study of climate as affecting the health of man does not appear to have been prosecuted in the United States in a systematic manner, except in the States of Michigan, Tennessee, and Colorado. Any success in this line of investigation naturally requires a certain amount of technical knowledge on the part of the investigator, which, as a rule, is not found outside of the professional ranks. It is pleasing to notice, however, that a very large number of professional men are to-day actively coöperating with the Signal Service as voluntary observers in gathering climatic data. There is still a vast field open to individual effort and the degree of success to be obtained by the professional investigator in this all-important line of study depends largely upon the amount and quality of the data gathered by individual observers.

In commerce the influence of a knowledge of the weather on all our operations, whether on land or sea, can not be measured in a report of this nature. It is desired, however, to throw out a few suggestions as to the value of climatic data to the business interests of a community.

In projecting lines of traffic or in shipping perishable goods it is a matter of importance to know what precautions, if any, need be taken to prevent interruptions of traffic or damage to goods, and herein lies the value of a continuous meteorological record, since the conditions which have obtained in one season may be entirely reversed during another season. It is also necessary to know the probability of extreme weather being experienced, and this is only possible when long records are available.

And again the climatic record is an important factor in determining the amount of rainfall in catchment areas when public works, such as canals, irrigation works, storage reservoirs, and waterworks, are about to be constructed. Thus the necessity for and value of climatic and meteorological data might be elaborated upon at great length.

The weather bureau is charged by law with announcing the approach and probable force of storms and in so doing requires certain physical data of pressure, temperature, humidity, wind and weather. These data, after serving their purpose in weather forecasting, are utilized in the preparation of climatic charts and discussions of current weather conditions. It is obvious, however, that the data received from the regular stations of the bureau are quite insufficient for determining with great precision the general climatic conditions of a country so extensive as this. Therefore the work of the regular observers is supplemented by individual effort on the part of public spirited citizens in each State and Territory of the Union, the united effort furnishing in the monthly weather review a publication unique in its comprehensiveness of data as compared with the publications of any other nation.

More observers are still desired, one in each county not already occupied. Generally speaking the States east of the Mississippi River are well covered with observers, but the number west of the Mississippi is scarcely a tenth of what it should be.

The relations which exist between the weather bureau and its voluntary observers are clearly set forth to all who may by application express a desire to become such.

COÖPERATION OF THE MEDICAL DEPARTMENT, U. S. ARMY.

The Medical Department of the Army has continued its valuable coöperation. The number of reports received during the year through the courtesy of the Surgeon-General aggregates 1,428; the number of posts reporting monthly being on an average 119. The uniformly prompt and effective action of the Medical Department in supplying occasional omissions in the monthly registers is gratefully acknowledged.

COÖPERATION OF THE GEOLOGICAL SURVEY.

The irrigation branch of the Geological Survey has kindly supplied the results of their observations of rainfall in Arizona, Colorado, and New Mexico for use in the preparation of the monthly weather review. These observations, principally from regions whose rainfall is practically unknown, are of the utmost value in constructing climatic charts of the arid region. A total of 469 monthly reports has thus far been received. The number of stations reporting through the Geological Survey averages about 48.

COÖPERATION OF THE PACIFIC RAILWAY SYSTEM.

The railway has through the observer of this service at San Francisco continued to furnish monthly values of temperature, precipitation, and wind direction from 188 stations. The number of summaries received during the year aggregates 2,256. It is not perhaps widely known that this railroad company has a number of climatic records, each 20 years in length, covering a portion of the States of California, Nevada, and the Territories of Arizona and Utah. The example of enterprise here given is worthy of emulation.

COÖPERATION OF THE HYDROGRAPHIC OFFICE, NAVY DEPARTMENT.

Much valuable aid has been extended to the Signal Office throughout the year by the active coöperation of the Hgdrographic Office of the Navy Department. International observations made by captains of ocean steamships and sailing vessels, whereby the paths of depression in the North Atlantic have been charted and discussed, have been received for six or more months of the year from 451 vessels and for less shan six months from 441 vessels—an aggregate of 892 vessels from which about 3,924 reports have been received.

COÖPERATION OF NEW YORK HERALD WEATHER SERVICE.

The New York Herald weather service has also continued its valuable coöperation throughout the year, having forwarded to this bureau an aggregate of 541 reports made by captains of 123 vessels. These marine reports with logs of vessels accessible at the Navy Department, supplemented by the Signal Service or land reports at this office, are so great and pertinent that a complete revision of the geography of the air over sea and land in a treatise upon winds of the globe, and especially cyclones, is now awaiting the pen of another Loomis or a modern Maury. These cyclones, coming as they do from southeastern seas and striking our coast south of Hatteras, are beyond the cognizance of complete investigation of this service until they come ashore and then, like the true mariner, their land paths are not always straight and regular. Of all these phases of storm movement the utmost attainable information is valuable and with the international series of observations conducted by this service for ten years in every sea will form a basis for scientific research the resulting benefits of which are all-important.

Nine hundred and twenty-four standard meteorological instruments, valued at $2,784 were issued to voluntary observers during the year. There were broken during the same period 165 instruments (thermometers), valued at $441; 60 per cent. of these instruments were maximum thermometers. This unusually large breakage was undoubtedly due to unfamiliarity with the principles and construction of the instrument and difficulty in properly mounting the same.

A circular letter was prepared and sent out with each issue, describing the instruments and giving explicit directions as to setting up and using both the maximum and the minimum self-registering thermometers. These instructions have already accomplished good results, and it is hoped, in a new book of directions to voluntary observers, in course of preparation, to make so clear and plain every feature of the manipulation of these instruments that few will be broken.

TABLE OF THERMOMETERS AND RAIN GAUGES ISSUED TO VOLUNTARY OBSERVERS, BY STATES.

State.	Thermometers.						Rain gauges.		Total.	
	Dry.		Maximum.		Minimum.					
	Prior to June 30, 1889.	From June 30, 1889, to July 1, 1890.	Prior to June 30, 1889.	From June 30, 1889, to July 1, 1890.	Prior to June 30, 1889.	From June 30, 1889, to July 1, 1890.	Prior to June 30, 1889.	From June 30, 1889, to July 1, 1890.	Prior to June 30, 1889.	From June 30, 1889, to July 1, 1890.
Alaska	1	4	1	4	1	4	1	5	4	17
Alabama	15	5	11	15	12	14	15	12	53	46
Arkansas	11	2	10	2	11	4	13	2	45	10
Arizona	.....	3	.....	17	.....	17	1	22	1	59
California	21	3	11	7	10	7	14	5	56	22
Colorado	14	7	44	7	42	8	33	6	133	28
Connecticut	.....	.....	.....	1	.....	1	1	.....	1	2
Delaware	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
District of Columbia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Florida	5	6	6	2	7	2	9	7	27	17
Georgia	2	4	3	2	3	2	5	8	13	16
Idaho	4	3	3	9	4	7	5	8	16	27
Illinois	.....	.....	1	3	1	1	1	3	3	7
Indiana	4	7	.....	6	1	5	2	14	7	32
Indian Territory	.....	2	.....	3	.....	3	.....	4	.....	12
Iowa	2	8	6	8	5	10	9	7	22	33
Kansas	3	4	4	11	4	11	5	13	16	39
Kentucky	14	6	9	6	11	5	20	4	54	21
Louisiana	4	1	1	8	3	6	4	4	12	19
Maine	1	1	1	.....	1	.....	1	1	4	2
Maryland	1	4	2	.....	1	1	3	1	7	6
Massachusetts	.....	.....	.....	.....	.....	.....	1	.....	1	.....
Michigan	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Minnesota	.....	3	.....	3	1	2	.....	4	1	12
Mississippi	8	4	8	10	10	8	13	6	39	28

TABLE OF THERMOMETERS AND RAIN GAUGES ISSUED TO VOLUNTARY OBSERVERS, BY STATES—Continued.

State.	Thermometers.						Rain gauges.		Total.	
	Dry.		Maximum.		Minimum.					
	Prior to June 30, 1889.	From June 30, 1889, to July 1, 1890.	Prior to June 30, 1889.	From June 30, 1889, to July 1, 1890.	Prior to June 30, 1889.	From June 30, 1889, to July 1, 1890.	Prior to June 30, 1889.	From June 30, 1889, to July 1, 1890.	Prior to June 30, 1890.	From June 30, 1889, to July 1, 1890.
Missouri	2	9	.....	13	1	13	2	15	5	50
Montana	6	3	2	8	4	6	5	6	17	23
Nebraska	10	3	8	6	13	3	15	4	46	16
Nevada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
New Hampshire	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
New Jersey	.....	.....	1	4	2	3	3	2	6	9
New Mexico	5	4	4	10	2	10	5	7	16	31
New York	10	9	3	11	11	7	15	5	39	32
North Carolina	6	2	3	5	5	3	8	.....	22	10
North Dakota	4	4	6	4	6	3	6	6	22	17
Ohio	.....	.....	1	1	1	1	.....	1	2	3
Oregon	7	5	8	8	10	5	10	5	35	23
Pennsylvania	2	.....	5	.....	4	1	4	.....	15	1
Rhode Island	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
South Carolina	2	.....	1	.....	1	.....	2	1	6	1
South Dakota	8	5	4	5	6	3	9	7	27	20
Tennessee	1	.....	1	.....	1	.....	1	.....	4	.....
Texas	25	10	17	12	23	13	35	8	100	43
Utah	7	9	8	4	6	5	8	13	29	31
Vermont	2	1	2	1	2	1	2	1	8	4
Virginia	1	6	4	6	6	4	7	8	18	24
Washington	.....	5	1	11	1	11	1	11	3	38
West Virginia	1	3	1	1	1	1	2	3	5	8
Wisconsin	10	2	5	6	4	6	10	2	29	16
Wyoming	1	4	2	6	2	6	2	6	7	22
Miscellaneous	5	2	1	1	2	.....	5	2	13	5
Total	225	163	209	247	242	223	313	249	989	882

The Chief Signal Officer, having recognized and early adopted the principle that temperature means derived from readings of self-registering thermometers recording the highest and lowest heat or cold serve the best practical purpose among the various grades of stations and observers that obtain in the great collection of data by this service, the policy of issuing to voluntary observers maximum and minimum thermometers has largely prevailed during the past year. This system of obtaining temperature means or averages, having been adopted for the regular Signal Service stations, its extension, as far as possible, to the voluntary observers has made the thermometric data more comparable, due consideration being given to elevation and local characteristics of country immediately surrounding the station. Besides these considerations, the greater value of temperature observations flowing from quite a universal record of the highest and lowest at any time of the day or night is recognized in all climatic investigations, especially those pertaining to horticulture and agriculture.

Another valuable and noteworthy feature is that the height of the thermometer at any hour is readily seen from the minimum or alcohol instrument. This extension in the utility of the voluntary system to all agricultural, horticultural, and kindred interests is apparent to the fruit-grower or vineyardist who must know the very lowest temperature to which his tender plants may be exposed. The mean temperature of a place alone fails to convey this information.

The records of many of the voluntary observers however, when placed side by side with those having exposure in standard shelters, are seen to be defective, and this is attributable to improper exposure in defective shelters or non-exposure, so to speak, in that the thermometers are not protected from either the direct rays of the sun during some time of the day, reflection from some neighboring surface or other cause which unduly increases the readings. Often the instruments are allowed to become exposed to the rain or snow which, falling upon the bulb, creates evaporation upon them and thus also unduly lowering the record.

To avoid, as far as possible, these errors, a shelter that is small, cheap, and such as can be made by almost any person, seems a desideratum. Illustration of such a shelter is submitted, made of six small pieces of lumber or boards, several hinges and screws; and in making requires only the usual available tools, a saw, square, screwdriver and small auger.

This shelter, as is seen from the illustration, is a folding one and adapted, in consequence, to enlarging of space, admitting the swinging and tilting of the instruments in setting. The shelter fulfills, in a cheap way, all the requisites when placed on the north side of a building, preferably under a porch.

It consists of five boards attached by hinges to a sixth, which latter is firmly fixed against the side or wall of a building; four of these boards are perforated by auger holes to give free circulation of air, always bored at an inclination upward, so as to exclude rain beating in and the sun in the early morning or late evening shining upon the instruments. A good rule to observe in obtaining the proper inclination of these perforations is to place on a piece of paper the exact thickness of the board as a horizontal line and at its right hand end erect a perpendicular line equal to the diameter or size of the auger or bit to be used in boring the holes. Now connect the extremities forming a right triangle. The inclination or angle of this longest line will be the proper one with which to incline the boring tool.

It will be readily seen from the cut that the top folds or turns upward, the ends turn to the right and left against the side of the building, and then secured in these positions by buttons. The side or front and bottom fold down and rest by their own weight in place against the side of building. This is the appearance of the shelter when opened for setting the instruments and allows the maximum thermometer to be turned about the pivot to which it is attached, and the minimum thermometer to be tilted without interruption or fear of striking against any object.

The following material is required for the least size of shelter that will conveniently fulfil the purposes, viz:

For back or base, one board 20 inches long, 12 inches wide, 1 inch thick.

For top, one board 24 inches long, 10 or 11 inches wide, 1 or ⅞ inch thick.

For bottom, one board 20 inches long, 8 inches wide, ½ or ⅝ inch thick.

For front, one board 20 inches long, 10 inches wide, ½ or ⅝ inch thick.

For ends, two boards 12 inches long on one side, 10 inches long on the other side, 8 inches wide, ½ or ⅝ inch thick, cut square at one end.

Ten small hinges and 40 suitable screws.

One hook or padlock, with fastenings to secure shelter.

Three large screws or spikes to secure back of shelter to building.

It is believed that the use of some shelter by all voluntary observers to whom standard instruments are issued should be insisted upon, and as this diagram placed in the hands of any carpenter will enable him to make the shelter, it supplies a safe, cheap, portable, and reasonably accurate shelter that can be attached to the north side of any building. It should be under a porch and, if not, a piece of canvas tacked along the hinged side of the top to prevent rain falling inside the shelter.

INDEX OF METEOROLOGICAL OBSERVATIONS IN THE UNITED STATES.

The lack of any complete and reliable index of the numerous meteorological observations which have been made in the United States, whether by private individuals, civil institutions, or Government bureaus, has often been a serious hindrance to rapid and efficient work in the preparation of statistical matter and in answering inquiries for climatic data. Moreover, the observers of the Signal Service, particularly those in charge of State weather service work, labor at a great disadvantage from a necessarily imperfect knowledge of the number and character of observations which have already been taken in their respective States.

The Chief Signal Officer, early to recognize the necessity of a work which shall give this information in convenient shape, directed on April 1, 1890, that steps be taken to prepare such an index, using one of the duplicating processes to reproduce the typewritten copy.

In the prosecution of this work, the original manuscript observations in the files of the Signal Office and the results of observations which appear in the published compilations of the Smithsonian Institution, Patent Office, Medical Department of the Army and in other publications, are examined and indexed. Thus far 61 pages of the index, embracing the States of Alabama, Arkansas, California, Colorado, Iowa, Louisiana, Missouri, Minnesota, Nevada, Nebraska, Wisconsin, and the Territories of Arizona, New Mexico, Utah, and Alaska have been completed. It is hoped that the work will be completed by July 1, 1891.

CARD INDEX OF STATIONS.

Work on the card index of stations, begun on April 1, 1889, has been prosecuted throughout the year. One thousand nine hundred and ninety cards have been added to the number on hand on July 1, 1889. The total number of cards now on hand is 4,304.

The card first prepared, having failed to meet the requirements for which it was designed, a new card was devised and put in use during the year. By utilizing both sides of the card a complete history of each station, including the kind, quality, and exposure of instruments in use is made available for convenient consultation.

TABLES OF ANNUAL MEAN TEMPERATURE AND TOTAL PRECIPITATION.

A notable departure in the methods of the office, as regards the treatment of annual values of temperature and precipitation at voluntary stations, was inaugurated by the Chief Signal Officer at the close of the calendar year 1889. In former years the results of observations were published for a very few stations—scarcely 1 per cent. of the whole number—and consequently the meteorological conditions for the year were very imperfectly represented. Beginning, as before stated, with the close of the year 1889, there were computed in the division from the values which had been published in the Monthly Weather Review, the mean annual temperature and the total precipitation for over a thousand stations. To these values were added the extremes of temperature for the year, date of occurrence, the departure of the average temperature, and total precipitation for the year 1889, departure from the normal, and other valuable climatic data; the whole, with appropriate charts, being published as a supplement to the Monthly Weather Review for December, 1889.

ANNUAL REPORT TABLES.

The general meteorological tables for the United States, as printed in the annual report of the Chief Signal Officer for 1889, pages 178 to 379, inclusive, were prepared in the division during the year.

These tables contain much valuable data for the use of the division in its current work in supplying the public with information that otherwise could not possibly be furnished. An unusual degree of care was exercised in the preparation of these tables, and it is therefore believed that they will be found as nearly correct as possible. Voluntary observers or others noticing an error in any particular have been invited to report it.

SPECIAL WORK UNDERTAKEN AND COMPLETED DURING THE YEAR.

The special work undertaken and completed during the year was considerably greater than in former years. The more important matters are as follows:

(1) At the request of the special committee of the United States Senate on irrigation of the arid lands, through its agent, Col. R. J. Hinton, tables of rainfall for Montana, North and South Dakota, Nebraska, and Kansas, to include August, 1889, were prepared and forwarded to the committee in October.

These tables were based upon all the records available, and contained, in addition to a tabular history of all meteorological stations in the States named, the average, the greatest and the least precipitation at each station for each month of the year. The completed tables comprise records from 351 stations, equivalent to about twenty quarto pages. This compilation substantially completes the tabulation of the rainfall records of the arid region—in fact, of almost the entire trans-Mississippi country. It is regretted that the tables have not been printed, since the advantages of having the rainfall of this section in convenient form for use or reference, can not be overestimated. It may be added that the rainfall records for the greater part of the arid region have already been printed in Senate Executive Document No. 91, Rainfall on the Pacific Coast and the Western States and Territories.

CLIMATE OF NEBRASKA.

(2) A report on the climate of Nebraska, with charts and tables, was prepared under the personal supervision of the Chief Signal Officer and submitted to the United States Senate in compliance with Senate resolution dated April 22, 1890. This report, now being printed, is one of the most thorough and comprehensive of its kind ever made by the Signal Office, and will be of very great value to the office in supplying information to persons interested in agricultural pursuits in Nebraska and contiguous States. All sources of information were exhausted in the preparation of the charts and tables comprised in the report, the tables being brought down to April 1, 1890.

NORMAL TEMPERATURE CHARTS FOR MICHIGAN.

(3) Normal temperature charts for the State of Michigan for the months of January to June, were prepared during the year for publication in the stated issues of the reports of the Michigan weather service. It is expected that the remaining charts, July to December, will be completed during the ensuing year.

The isotherms on the winter charts were drawn for every degree, but on the charts for the spring and summer months, when temperature changes are more rapid, the lines were drawn for every two degrees. The scale of the map upon which these charts were published is sufficiently large to show quite clearly the influence of the great lakes on the temperature of the State and many other interesting features.

By charting temperature data for any given area the greater portion of the errors which inevitably creep into any extensive compilation are quickly discovered and rectified. Improper exposures of thermometers also are indicated by giving values above or below the normal.

It is suggested that the entire mass of temperature data now in the files of the office be charted, both as a means of placing it in convenient shape for use and of correcting such erroneous values as may be found therein.

COMPILATION OF BACK RECORDS.

(4) The vault of the Signal Office is filled with volumes containing masses of figures absolutely useless in their present condition, but which, when worked up into definite shape, give expression to physical laws applicable to the manifold interests of modern civilization.

Probably the most important work of the year, measured by immediate and practical results, was that of reducing a small portion of this vast accumulation of meaningless figures to an orderly expression of one of nature's fixed laws.

The Signal Service has probably the most valuable set of wind-velocity records by self-registering instruments extant, yet hitherto no attempt has been made to arrange these records for use in the solution of mechanical or other economical questions. The hourly velocities even, for all years prior to 1884, have neither been counted nor tabulated on proper forms.

The mean hourly velocity of the wind as heretofore determined and published represents simply the average of the twenty-four hours, and gives therefore only a general value for the day. An average hourly velocity of ten miles per hour, computed by dividing the daily movement by the number of hours in the day, naturally includes velocities above and below the average. So that in some cases, especially at stations where the monthly movement is inconsiderable, the results derived by the method above described may be misleading without due consideration of this fact.

The first step in the determination of the true average hourly velocity of the wind (that is, the mean velocity for each of the twenty-four hours) was to count, tabulate, and assemble into hourly periods a portion of the year 1884, for about sixty representative stations throughout the United States. A total of 157,680 hours of wind movement was accordingly tabulated, and by combination with the records previously made by observers in charge of stations (nearly two million hours), a seven-year normal velocity for each hour of the day was obtained.

The accomplishment of this work was laborious and its completion was greatly retarded by the fact that a portion of the work done by the original observers was faulty and had to be verified from beginning to end. In addition to the foregoing the number of hours during which the wind blew continuously at the rate of twenty-five or more miles per hour were counted and tabulated.

These tables are of value to builders in that they show the months of the year during which extreme wind velocities are to be expected and the force attained by such velocities.

Maritime interests are equally interested in this class of data, particularly marine underwriters in the larger ports of the United States. Private enterprise collects yearly statistics of losses on the seas and lakes, whether by fire, collision, or storm, as it is largely upon such information that future risks may be taken intelligently. It follows as a corollary to the foregoing that, by a careful comparison of the storm winds and the losses due directly thereto, the probability of loss by storms during the season of danger to shipping could be approximated with a considerable degree of certainty.

The data are also of value to agricultural interests in showing the probability of damage to fields of grain by strong and continuous winds. It is also useful in many sections of the country in determining the availability of the windmill, especially where pumping water for stock or irrigation of small fruit or garden patches. The use of anemometers registering wind velocities, as well as the collection of other climatic data at military posts and within the arid region where military telegraph lines years since required the presence of expert signal-service operators, has furnished a treasury of these important data.

DIURNAL VARIATION OF PRESSURE AND TEMPERATURE.

(5) The investigations, conducted under the personal supervision of the Chief Signal Officer, upon the diurnal variation of pressure and temperature, and the consequent determination of normal values of pressure and temperature for use in the forecast division, have formed a very important branch of work in the division during the last half of the year.

The normals of pressure and temperature computed for the hours of 7 a. m., 3 and 10 p. m. not being strictly applicable to the hours of 8 a. m. and 8 p. m., at which forecasts are now made, it became necessary to determine, as before stated, new normals for the new hours, or which amounts to the same thing, the diurnal variation of the two elements under consideration. Having the diurnal variation determined once for all, it will be possible to reduce the pressure or temperature at any hour, or for any combination of hours, to the true mean of the day. In the climatic work of the division, the hourly corrections for temperature, especially for all portions of the United States west of the eightieth meridian, are much needed, since a great many voluntary observers have, in the past, recorded and now find it impracticable to take more than one observation daily. A single observation of temperature, unless corrected for hourly variation, is of little utility for constructing averages which shall be comparable with those at surrounding stations. As before noted, the use of self-registering thermometers and their approximate proper exposure will largely eliminate for the future the applications of corrections.

The prosecution of this work entails much labor on account of the many inaccuracies to be found in the records of the early observers and the fact that the monthly averages of all elements at the hours of 7 a. m., 12 noon, 2 and 9 p. m. were never computed nor even tabulated in such a manner as to render computation an easy task. The failure to do this work, the necessity of which is now so obvious, was no doubt due to the largely tentative methods adopted in a service not hedged about with well defined customs and precedents.

Thus far, six-year temperature averages for the hours of 7 a. m., 12 noon, 2 and 9 p. m., at 60 representative stations, a total of about 17,000 temperature averages, and pressure averages for the same period at 44 stations, a total of about 13,000 averages, have been computed. The averages from 1871 to 1876, inclusive, for the 60 typical stations, remain to be computed, besides averages for such additional stations as may be necessary to supplement the data furnished by those above mentioned.

The hourly corrections necessary to be applied to the temperature of any hour, in any month of the year, to reduce such temperature to the true mean temperature of the day have been computed for 60 stations for the months of May and June, and the hourly corrections for pressure for all months at all stations west of the Mississippi River have been substantially completed.

It is expected that the list of hourly corrections above described will be completed during the ensuing year. When finished, the present broken series of observations, extending through nineteen years, may be reduced to a harmonious whole of lasting usefulness in the current work of the Bureau.

A very high grade of accuracy is required in the clerical force which makes the original computations, since all deductions must be based upon the small known differences which exist between the values of separate hours during the same period of time. If, however, errors not sufficiently great to be detected by inspection have been made either in transcribing from the original or in subsequent computations, the deductions are vitiated in proportion to the magnitude of the errors.

One of the facts brought out by examination of the early records is that it is always advisable to have the meteorological work of an observer thoroughly examined upon receipt, as before noted, since it does appear that there were observers in time past, who were so confident of their ability to successfully counterfeit the laws of nature that they wrote up their observations several hours before or after the schedule time.

COMPILATION OF STATION RECORDS.

(6) In addition to the compilations before mentioned the records division, under instructions of the Chief Signal Officer, prepared a suitable form and required the observers in charge of the most important stations to tabulate thereon the daily precipitation, the daily extremes of temperature, the hourly wind movement for 1883, and at a few stations the daily stages of water in the river. The importance of this action lies not so much in the immediate results attained, as in the fact that a step has been taken towards a systematic arrangement of the meteorological records pertaining to the individual Signal-Service stations.

In requiring these compilations to be made, attention was called to the fact that success in making local forecasts of the weather, a duty recently devolved upon Signal-Service observers, could be obtained only by careful and continuous study, aided by a thorough knowledge of all local characteristics associated with weather changes, and to the necessity for compiling the meteorological data contained in their office records in such manner as would afford opportunities for intelligent study, and at the same time enable them to refer readily to any and all of the more important characteristics of each distinctive feature of local climatology. Observers were also instructed to arrange the daily extremes of temperature so that the maximum temperature for any year would face the minimum temperature for the same year, and in other ways to present the greatest measure of information in the least possible space. The observers, with but few exceptions, were prompt to forward the data called for, which, it may be added, have fully met the anticipations of the office, both as to their arrangement and utility.

The normals and other data furnished the forecast official since February have been made for decades instead of for the monthly periods as heretofore, causing some additional labor. The averages for decades are more valuable, particularly in the spring and autumn, when the seasons are changing rapidly. A division of the year into decades, beginning March 1, has been advocated by Sergt. Orin Parker, meteorological reporter at Columbus, Ohio. Such a system saves much work in statistical meteorology, and arises before the office as a question of advisability for adoption.

WEATHER CABLEGRAMS TO EUROPE.

The work of charting marine data for the daily cablegram to the French meteorological bureau was transferred to the forecast division during the year, where it could be accomplished more expeditiously and with less clerical and messenger service.

NEWSPAPER REPORTS.

Newspaper clippings containing storm reports have been received during the year from the regular Signal-Service observers, voluntary observers, and from other sources. These reports are invariably turned over to the review division for use in the preparation of the Monthly Weather Review, after which they are, as a rule, destroyed, it having been found that among the vast number of such reports received many are duplicates and still others were of no value for permanent record. Moreover, no perfect plan has yet been proposed whereby these reports, or the most valuable of them, could be preserved without an expenditure of labor incommensurate with the results attained.

LETTERS SENT AND RECEIVED.

The number of letters "sent" prepared in the division during the year is as follows:

For autograph signature of the Chief Signal Officer, press-copied and mailed in the records division	1,106
For signature of records officer to observers of the Signal Service, press-copied and mailed in correspondence division	7,103
For signature of records officer, including circular letters and acknowledgments mailed in records division, only the more important letters being press-copied	12,703
Total	20,912

The correspondence of the division, although showing an increase of 11 per cent. over that of 1889, has been conducted with dispatch and economy of labor. The acknowledgment of receipt of voluntary observers' meteorological reports was changed during the year from a formal letter to a postal card, thus reducing the labor of writing addresses one-half, in addition to saving the Government the cost of the envelopes used in mailing the formal acknowledgments each month. The use of skeleton forms of letters, of which over thirty have been prepared, makes it possible for one clerk to prepare the large correspondence of the division.

Three thousand four hundred and twenty-eight letters were received and recorded during the year. This number, while about 20 per cent. less than for the same period last year, does not indicate, as might be inferred, a falling off in the correspondence of the division, but rather that unimportant papers have not been entered as heretofore, and that the number of circular letters of inquiry sent out concerning tornadoes has been very much reduced.

FORMS RECEIVED, CHECKED, AND FILED.

The table below shows in detail the number of forms and reports received and filed in the division during the year. A check list is kept of the more important ones only.

Forms 101. Original record of observations (second-order station)	1,752
Forms 102. Anemometer record sheets	47,965
Forms 103. Anemoscope and rainfall sheets	5,475
Forms 112*d*. Cautionary and storm signals	576
Forms 112*b*. Report of cold-wave displays	1,440
Forms 114. River observations	1,104
Forms 116. Annual report of observers	176
Forms 117. Comparative barometer readings	1,800
Forms 118. Hourly readings (Thermograph)	580
Forms 118. Hourly readings (Barograph)	206
Forms 119. Original record of observations (third-order stations)	360
Forms 122*b*. Monthly meteorological report (voluntary observers)	8,785
Forms 122*i*. Advance summary of State weather service observers' reports	288
Forms 124. International observers' reports	3,014
Forms 127. Annual meteorological summary	438
Forms 138. Daily observations (cotton-region stations)	2,520
Forms 140. Abstract of daily journal	2,112
Forms 144. Monthly report of observations (cotton-region stations)	966
Forms 165. Hourly wind movement	2,820
Forms 174. Daily rainfall, etc	2,440
Forms 180. Monthly meteorological report (rainfall stations)	732
Forms 184c. Monthly summary observations (State weather service)	288
Forms 203. Cipher report of observations	106,580
Total	192,417

The clerks of the division are deserving of commendation for the uniformly close attention they have given to their work, and the generally satisfactory manner in which their duties have been performed. It is earnestly recommended that provisions be made for the advancement in grade of the most deserving clerks.

It is worthy of mention that as a rule the work of persons appointed from the copyists' register of the Civil Service Commission falls considerably below the standard required of all clerks who successfully serve in the records division. There is but little current work in the division which may be termed copying. Moreover, experience has proved that it is dangerous business to permit a copyist, however accurate he may be, to transcribe or tabulate meteorological data which are to him as so many meaningless figures. The results of inexperienced work in former years are manifest on every hand. In many cases the original work has been multiplied threefold simply on account of the inexperience of copyists. The policy of the Chief Signal Officer in preferring for appointment to the grade of meteorological clerk persons who have passed the necessary examination and who have had previous experience in the Signal Service, has been productive of excellent results, both in securing a much better grade of clerks and in enabling those having charge of the division to devote more time to important matters and less to detailed instructions in the minutæ of their subordiates' work.

The actual personal interest and attention of the Chief Signal Officer to all details of work carried on by this division has resulted in such intimate acquaintance with the special work of each member of the clerical force that any reference to the individual deserts of its personnel would perhaps be gratuitous. Exceptional commendation in no small measure is due, however, to the chief clerk of the division, Mr. Alfred J. Henry, for his thorough knowledge of the routine duties and his grasp of the application of the collected data in the lines of meteorological research.

Respectfully submitted.

W. A. GLASSFORD,
Second Lieutenant, Signal Corps, Signal Officer,
Assistant and Records Officer.

CHIEF SIGNAL OFFICER.

APPENDIX 10.

LIST OF REGULAR AND SPECIAL STATIONS OF THE SIGNAL SERVICE ESTABLISHED SINCE NOVEMBER 1, 1870, TOGETHER WITH DATES ON WHICH THOSE NOT IN OPERATION ON JUNE 30, 1890, WERE CLOSED. SPECIAL DISPLAY STATIONS HAVE NOT BEEN INCLUDED.

State and station.	Class.	Established.	Observations began.	Closed.	Remarks.
Alabama:					
Auburn	Third order	Feb. 1, 1888	Feb. 1, 1888		
Birmingham	Cotton region	July 14, 1881	Sept. 15, 1881	Oct. 31, 1886	
Calera	....do	Mar. 29, 1882	Apr. 1, 1882	Oct. 31, 1887	
Decatur	River	Oct. 1, 1875	Oct. 1, 1875		Also cotton region from April, 1882.
Demopolis	Cotton region	Mar. 31, 1882	Apr. 1, 1882	May 10, 1884	
Eufaula	....do	Feb. 25, 1884	May 12, 1884		
Evergreen	....do	....do	Apr. —, 1884		
Fort Deposit	....do	....do	Apr. 1, 1884		
Livingston	....do	....do	....do.		
Marion	....do	....do	May 10, 1884		
Mobile	Second order	Nov. 7, 1870	Nov. 7, 1870		
Montgomery	....do	Nov. 9, 1870.	Nov. 9, 1870		Closed from December 18, 1870, to September 5, 1872.
Opelika	Cotton region	Mar. 28, 1882	Apr. 1, 1882		
Pine Apple	....do	Mar. —, 1882	....do		
Scottsborough	....do	Mar. 21, 1882	....do	Aug. 31, 1889	
Selma	....do	July 14, 1881	Sept. 12, 1881		
Talladega	....do	Mar. 29, 1882	Apr. 1, 1882	May 10, 1884	
Tuscaloosa	....do	July 14, 1881	Sept. 16, 1881	Oct. 31, 1883	
Tuscumbia	....do	....do	....do		
Uniontown	....do	....do	Oct. 14, 1881	May 10, 1884	
Alaska and adjacent territory:					
Alexander, Fort	Second order	Aug. 1, 1881	Aug. 1, 1881	June 12, 1886	
Anvik	Third order	Aug. 31, 1882	Sept. 19, 1882		Closed June 1, 1885, to September 1, 1887.
Atka	Second order	May 4, 1879	May 7, 1879	Aug. 31, 1886	Third order from September 1, 1879.
Atton	....do		July 22, 1880	May 12, 1881	
Bering Island	....do	May 22, 1882	May 22, 1882	May 7, 1886	
Bethel	....do	Mar. 24, 1885	Nov. 1, 1885		No observations received since March, 1886.
Chernofsky	Third order	Mar. 16, 1881	Oct. 1, 1881	Feb. 28, 1882	

Chilkaht	....do	May 3, 1881	Sept. 18, 1881	Dec. 31, 1887	
Cordova Bay	....do	Mar. 16, 1881	Aug. 14, 1882	Dec. 31, 1882	"Howkan."
Harrisburg	....do	May 17, 1881	June 4, 1881	Oct. 31, 1884	Juneau City, also called Rockwell.
Hoochnahoo	....do	May 3, 1881	May 12, 1881	Mar. 31, 1888	Killisnoo.
Hoonyah	....do	Nov. 11, 1881	Mar. 26, 1882	Mar. 31, 1882	
Kenai	....do	Mar. 16, 1881	Sept. —, 1882	May 31, 1886	
Koskokvim	....do	....do	July 21, 1882	May 14, 1886	
Kyska	....do		May 13, 1885	May —, 1886	
Marzovia	....do		Nov. 2, 1881	May 24, 1883	
Mission	....do	Apr. 15, 1881	Aug. 18, 1883	May 31, 1886	
Nuduckayet	....do	Aug. 31, 1882	Aug. 1, 1882	....do	Tannanah.
Nulato	....do	....do	Oct. 1, 1882	Dec. 16, 1882	
Omilak	....do		Jan. 20, 1884	Apr. —, 1885	
Petropaulovski	....do	July 13, 1882	July 13, 1882	Aug. 31, 1886	
Point Barrow	Second order	Oct. 17, 1881	Oct. 17, 1881		Ooglaamie. Closed from August 7, 1883, to August 16, 1889, now third order.
Port Etches	Third order	Mar. 16, 1881	May 1, 1883	Aug. 31, 1884	
Reliance, Fort	....do	Aug. 31, 1882	Sept. 1, 1882	May 31, 1886	
St. Michael's, Fort	Second order	June 27, 1874	June 28, 1874	June 30, 1886	
St. Paul's Island	....do		June 1, 1872	Dec. 31, 1882	
Sitka	....do	Mar. 30, 1881	Mar. 30, 1881	Sept. 30, 1887	
Tchatowklin	Third order	Aug. 31, 1882	Oct. 1, 1882	May 19, 1886	
Ugashik	....do		Aug. 1, 1883	Jan. 18, 1886	
Unalashka	Second order	Aug. 18, 1878	Aug. 22, 1878	May 22, 1886	Closed April 28, 1879, to May 29, 1880; third order June, 1881, to March 31, 1882.
Wrangel, Fort	Third order	Aug. 14, 1881	Aug. 25, 1881	Aug. —, 1882	
Arizona:					
Apache, Fort	Second order	Oct. 9, 1877	June 23, 1878		Third order since April 1, 1888.
Bowie, Fort	Third order	Apr. 18, 1877	Oct. 6, 1883		
Burke's	Second order	Dec. 1, 1877	Dec. 5, 1877	Nov. 30, 1880	
Cooley's	Repair	Mar. 26, 1890	June 1, 1890		
Corilla Station	Second order	Mar. 6, 1875	Nov. 5, 1875	June 11, 1877	Camp Lowell.
Florence	....do	Nov. 12, 1874	Nov. —, 1875	Apr. 30, 1882	
Grant, Fort	....do	Nov. 9, 1875	July 14, 1877		
Maricopa	....do	Nov. —, 1873	Oct. 25, 1875	July 21, 1887	No observations from March 9, 1878, to October 21, 1883.
McDowell, Fort	Third order	Mar. 13, 1882	Dec. 1, 1883	Feb. 28, 1890	
Phœnix	Second order	Nov. —, 1873	Feb. 6, 1876	....do	Third order from January 1, 1882.
San Carlos Agency	Third order	Dec. 6, 1879	June 1, 1881		

LIST OF REGULAR AND SPECIAL STATIONS OF THE SIGNAL SERVICE ESTABLISHED SINCE NOVEMBER 1, 1870, ETC.—Continued.

State and station.	Class.	Established.	Observations began.	Closed.	Remarks.
Stanwix	Second order	Jan. —, 1874	Oct. 25, 1875	Dec. 4, 1877	Moved to Burke's.
Thomas, Fort	....do	Sept. 22, 1877	Apr. 1, 1880	....	Also Camp Goodwin and Maxie. Third order since April 1, 1887.
Tucson	....do	Dec. 2, 1873	Oct. 30, 1875	June 15, 1883	
Verde, Fort	....do	Nov. 9, 1874	Dec. 6, 1875	....	Third order since October 11, 1883.
Whipple Barracks	....do	Nov. 19, 1873	Nov. 28, 1875	....	Prescott.
Wickenburg	....do	Jan. 6, 1874	Nov. 13, 1875	Jan. 31, 1886	Third order from July, 1883, to January 31, 1886.
Wilcox	Third order	May 27, 1881	Nov. 14, 1883	....	
Yuma	Second order	Nov. 18, 1873	Oct. 4, 1875	....	
Arkansas:					
Arkansas City	River	Sept. 12, 1881	Apr. 1, 1882	....	Cotton region to May 15, 1888.
Brinkley	Cotton region	Mar. 23, 1882	....do	....	
Camden	River	July 1, 1885	Dec. 1, 1885	....	
Dardanelle	....do	Jan. 11, 1886	June 20, 1886	....	
Devall's Bluff	Cotton region	Mar. 22, 1882	Apr. 1, 1882	....	
Forrest City	....do	Apr. 30, 1886	May 1, 1886	....	
Fort Smith	Second order	Apr. 13, 1879	Apr. 13, 1879	....	River only to May 31, 1882.
Fulton	River	Jan. 10, 1885	Nov. 8, 1885	....	
Helena	....do	Feb. 25, 1874	Feb. 25, 1874	....	Also cotton region from May 19, 1884.
Kensett	Cotton region	July 14, 1881	Sept. 11, 1881	Oct. 31, 1887	
Little Rock	Second order	Apr. 21, 1873	Apr. 21, 1873	....	River to July 1, 1879; second order thereafter.
Madison	River	Mar. 24, 1882	Apr. 1, 1882	May 10, 1889	Cotton region to April 22, 1886.
Magnolia	Cotton region	Feb. 25, 1884	May 24, 1884	Oct. 31, 1886	
Malvern	....do	July 14, 1881	Sept. 16, 1881	....	
Monticello	....do	....do	Sept. 13, 1881	....	
Newport	River	Feb. 25, 1884	Apr. 1, 1884	....	Also cotton region.
Pine Bluff	Cotton region	....do	May 14, 1884	....	
Prescott	....do	July 14, 1881	Sept. 17, 1881	....	
Russellville	....do	....do	Sept. 15, 1881	....	
Texarkana	....do	....do	Sept. 18, 1881	....	
Walnut Ridge	....do	....do	Sept. 10, 1881	Sept. 30, 1883	
California:					
Bidwell, Fort	Second order	Sept. 12, 1882	Jan. 18, 1884	Nov. 15, 1888	Third order to June 14, 1885.

Cape Mendocino	*....do*	*Apr. 27, 1882*	*July 27, 1882*	*Dec. 31, 1886*	
Campo	....do	Jan. —, 1874	Sept. 28, 1875	Sept. 30, 1882	
Colusa	River	Jan. 19, 1879	Jan. 24, 1879	Dec. 15, 1887	
Eureka	Second order	Nov. 10, 1886	Jan. 1, 1887	....	
Folsom City	River	Dec. 15, 1878	Dec. 15, 1878	Apr. 30, 1887	
Fresno City	Second order	July 26, 1887	Aug. 16, 1887	....	
Keeler	....do	Feb. 1, 1885	Mar. 1, 1885	....	
Los Angeles	....do	May 21, 1877	July 1, 1877	....	
Marysville	River	Dec. 15, 1878	Dec. 15, 1878	Apr. 30, 1887	
Monterey	Sunset	July 1, 1877	Aug. 5, 1877	Oct. 2, 1880	
Oroville	River	Dec. 15, 1878	Dec. 15, 1878	Apr. 30, 1887	
Point Reyes Light	Third order	Oct. 3, 1888	Mar. 1, 1889	....	
Red Bluff	Second order	May 21, 1877	July 1, 1877	....	Office burned August 2, 1880, and observations resumed August 16, 1880.
Sacramento	....do	....do	....do	....	
San Diego	First order	Nov. 1, 1871	Nov. 1, 1871	....	
San Francisco	....do	Feb. 2, 1871	Feb. 2, 1871	....	
San Luis Obispo	Second order	Jan. 27, 1885	June 1, 1885	Apr. 19, 1886	Destroyed by fire.
Santa Barbara	Sunset	July 1, 1877	July 29, 1877	Oct. 2, 1880	
Visalia	Second order	May 21, 1877	July 1, 1877	June 15, 1883	
Yreka	Sunset	July 1, 1877	Aug. 1, 1877	Sept. 25, 1880	
Colorado:					
Colorado Springs	Second order	Nov. 12, 1873	Nov. 12, 1873	....	Closed from August, 1876, to July 1, 1887.
Denver	First order	Nov. 19, 1871	Nov. 19, 1871	....	
Durango	Third order	Jan. 25, 1882	Mar. 1, 1888	....	Rainfall observations only.
Kit Carson	Sunset	July 1, 1877	Aug. 1, 1877	Oct. 1, 1880	
Las Animas	Second order	Oct. 1, 1881	Oct. 1, 1881	May 31, 1888	
Montrose	....do	Nov. —, 1882	Feb. 5, 1885	....	
Pike's Peak	....do	July 2, 1873	Nov. 1, 1873	Sept. 30, 1888	
Pueblo	....do	July 1, 1888	July 1, 1888	....	
Trinidad	Sunset	July 1, 1877	July 29, 1877	Sept. 30, 1880	
Connecticut:					
New Haven	Second order	Dec. 10, 1872	Dec. 10, 1872	....	
New London	....do	Jan. 10, 1871	Jan. 10, 1871	....	
Delaware:					
Cape Henlopen	Third order	Mar. 1, 1885	May 17, 1885	June 18, 1887	
Delaware Breakwater	Second order	Jan. 16, 1880	Jan. 28, 1880	Feb. 28, 1885	
District of Columbia:					
Washington City	First order	Nov. 1, 1870	Nov. 1, 1870	....	
Florida:					
Cedar Keys	Second order	Nov. 7, 1879	Nov. 7, 1879	Mar. 31, 1890	

LIST OF REGULAR AND SPECIAL STATIONS OF THE SIGNAL SERVICE ESTABLISHED SINCE NOVEMBER 1, 1870, ETC.—Continued.

State and station.	Class.	Established.	Observations began.	Closed.	Remarks.
Florida—Continued.					
Fernandina	Cotton region	July 14, 1881	Apr. 1, 1882	Oct. 31, 1886	
Jacksonville	Second order	Sept. 11, 1871	Sept. 11, 1871		
Jupiter	....do	Jan. 1, 1888	Jan. 1, 1888		
Key West	....do	Nov. 1, 1870	Nov. 1, 1870		
Lake City	....do	....do	....do	Oct. 31, 1874	
Live Oak	Cotton region	July 14, 1881	Sept. 27, 1881	June 30, 1890	
Micco	Third order	Sept. 1, 1888	Sept. 1, 1888		
Pensacola	Second order	Nov. 10, 1878	Oct. 27, 1879		
Punta Rassa	....do	Aug. 15, 1871	Aug. 15, 1871	June 15, 1883	
St. Mark's	....do	Nov. 1, 1874	Nov. 10, 1874	Oct. 30, 1879	
Sanford	....do	Jan. 10, 1882	Jan. 1, 1883	June 30, 1887	
Sebastian	Third order	Feb. 15, 1888	Apr. 20, 1888		
Tampa	Second order	Feb. 2, 1890	Mar. 13, 1890		
Titusville	....do	July 1, 1887	June 10, 1887		
Waldo	Cotton region	July 14, 1881	Apr. 1, 1882	Oct. 31, 1886	
Georgia:					
Albany	....do	Sept. 30, 1881	Oct. —, 1881		
Allapaha	....do	Apr. —, 1882	Apr. 7, 1882		
Athens	....do	(?) 1881	Apr. 1, 1882		
Atlanta	Second order	Sept. 25, 1878	Sept. 25, 1878		
Augusta	....do	Nov. 2, 1870	Nov. 2, 1870		
Bainbridge	Cotton region	(?) 1881	Sept. 30, 1881		
Calhoun	....do	July 14, 1881	Sept. 1, 1881	Oct. 31, 1883	
Camak	....do	May 17, 1884	June 1, 1884		
Cartersville	....do	July 14, 1881	Sept. 1, 1881		
Columbus	....do	....do	Apr. 1, 1882		
Covington	....do	....do	....do	May 16, 1884	
Dalton	....do	....do	Sept. 1, 1881	Oct. 31, 1885	
Eastman	....do	....do	Apr. 1, 1882		
Fort Gaines	....do	....do	....do		
Gainesville	....do	....do	Sept. 1, 1881		
Greenville	....do	Apr. 1, 1882	Apr. 4, 1882	Oct. 31, 1887	
Griffin	....do	July 14, 1881	Sept. —, 1881		
Jesup	....do	....do	Sept. 22, 1881	June 30, 1890	

Macon	....do	(?) 1881	Apr. 1, 1882		
Madison	....do	(?) 1881	....do	May 21, 1884	
Millen	....do	July 14, 1881	Sept. 7, 1881		
Newnan	....do	....do	Sept. 1, 1881		
Quitman	....do	Mar. 28, 1882	Apr. 1, 1882		
Savannah	First order	Jan. 1, 1871	Jan. 1, 1871		
Smithville	....do	Sept. —, 1881	Apr. 1, 1882	June 30, 1890	
Thomasville	....do	Mar. 28, 1882	....do		
Toccoa	....do	July 14, 1881	Sept. 1, 1881		
Tybee Island	Second order	Jan. 1, 1874	June 11, 1874	Feb. 15, 1879	
Union Point	Cotton region	July 14, 1881	Sept. 1, 1881		
Washington	....do	May 15, 1884	June 1, 1884		
Way Cross	....do	July 14, 1881	Sept. 26, 1881		
Waynesborough	....do	May 20, 1884	June 1, 1884		
West Point	....do	July 14, 1881	Sept. 1, 1881		
Idaho:					
Boisé City	Second order	May 21, 1877	July 1, 1877	June 30, 1890	
Cœur d'Alene, Fort	Third order	Aug. 20, 1880	Sept. 1, 1881	June 16, 1887	Now known as Fort Sherman.
Eagle Rock	Second order	Dec. 30, 1880	Dec. 3, 1880	June 15, 1883	
Lapwai, Fort	Third order	July 1, 1879	Mar. 1, 1881	Oct. 31, 1883	
Lewiston	Second order	June 17, 1879	Nov. 23, 1879	Dec. 31, 1885	
Illinois:					
Beardstown	River	Mar. 7, 1885	Aug. 1, 1885		
Cairo	Second order	June 1, 1871	June 1, 1871		
Champaign	....do	Oct. 1, 1880	Oct. 13, 1880	Mar. 31, 1883	
Chicago	First order	Nov. 1, 1870	Nov. 1, 1870		
Evanston	Second order	Aug. 31, 1875	Aug. 31, 1875	July 31, 1876	
Grand Tower	River	Feb. 1, 1885	Feb. 17, 1885		
Mount Carmel	....do	Apr. 21, 1884	June 16, 1884		
Ottawa	Rainfall	July 1, 1887	Aug. 1, 1887		
Peoria	River	Jan. 13, 1882	May 1, 1882		
Springfield	Second order	July 1, 1879	July 1, 1879		
Warsaw	River	May 7, 1873	June 15, 1873		
Indiana:					
Evansville	River	Apr. 21, 1873	Apr. 22, 1873		
Greencastle	Second order	July 23, 1884	Oct. 1, 1884	Nov. 4, 1886	
Huntington	Rainfall	July 1, 1887	Aug. 1, 1887		
Indianapolis	Second order	Feb. 1, 1871	Feb. 10, 1871		
La Fayette	Rainfall	July 1, 1887	Aug. 1, 1887		
Logansport	....do	....do	....do		

LIST OF REGULAR AND SPECIAL STATIONS OF THE SIGNAL SERVICE ESTABLISHED SINCE NOVEMBER 1, 1870, ETC.—Continued.

State and station.	Class.	Established.	Observations began.	Closed.	Remarks.
Indiana—Continued.					
Mount Vernon	River	July 20, 1888	Oct. 22, 1888		
Rushville	Rainfall	July 1, 1887	Aug. 1, 1887		
Terre Haute	Third order	Nov. 28, 1886	June 1, 1887	Feb. 28, 1889	
Vincennes	River	Mar. 1, 1886	Jan. 23, 1887		
Indian Territory:					
Cantonment	Third order	Sept. 13, 1879	Dec. 22, 1883	Dec. 31, 1889	
Eufaula	Rainfall	July 1, 1887	Aug. 6, 1887		
Gibson, Fort	Second order	Apr. 1, 1873	Apr. 1, 1873	May 13, 1882	
Reno, Fort	Third order	Aug. 31, 1879	Jan. 1, 1883		
Sill, Fort	Second order	June 23, 1875	Sept. 22, 1875		
Supply, Fort	Third order	Oct. 7, 1879	Jan. 1, 1881	June 30, 1890	
Tulsa	Rainfall	July 1, 1887	Aug. 6, 1887		
Woodward	Repair	July 5, 1887	Mar. 7, 1888		
Iowa:					
Cedar Rapids	Rainfall	July 1, 1887	July 1, 1887		
Davenport	Second order	May 24, 1871	May 24, 1871		
Des Moines	....do	July 1, 1877	July 29, 1877		Sunset to August 1, 1878.
Dubuque	....do	July 10, 1873	July 10, 1873		
Keokuk	....do	July 16, 1871	July 16, 1871		
Le Claire	River	June 2, 1873	June 2, 1873		
Muscatine	....do	Jan. 1, 1878	Jan. 1, 1875		
Sioux City	Second order	July 1, 1887	Dec. 1, 1887		River to June 30, 1889; second order thereafter.
Kansas:					
Concordia	....do	Jan. 27, 1885	May 1, 1885		
Dodge City	First order	Sept. 1, 1874	Sept. 15, 1874		
Emporia	Sunset	Apr. 5, 1879	Mar. 23, 1879	Sept. 30, 1880	
Kirwin	Rainfall	July 1, 1887	Sept. 1, 1887		
Leavenworth	Second order	May 21, 1871	May 24, 1871		
Manhattan	....do	Dec. 21, 1875	Jan. 1, 1876		Closed from July 29, 1876, to October 27, 1887; river from October 27, 1887.
Oberlin	Rainfall	July 1, 1887	Aug. 23, 1887		
Salina	....do	....do	Sept. 1, 1887		
Topeka	Second order	Oct. 25, 1886	June 1, 1887		Third order from January 1, 1889.

Wallace	*Rainfall*		*Apr. 24, 1881*		*Sunset to May 28, 1881; closed from May 28, 1881, to June 30, 1887.*
Waterville	*Sunset*	July 1, 1877	Aug. 26, 1877	Sept. 30, 1880	
Wichita	Second order	July 1, 1888	July 1, 1888		
Kentucky:					
Bowling Green	Rainfall	July 1, 1887	July 1, 1887		
Burnside	River	Dec. 1, 1884	Dec. 15, 1884		
Catlettsburgh	....do	July 1, 1887	July 1, 1887		
Eddyville	....do	Nov. 1, 1886	July 26, 1887		
Falmouth	....do	July 1, 1887	Sept. 1, 1887		
Frankfort	....do	....do	....do		
Greensburgh	Rainfall	....do	Aug. 1, 1887		
Lexington	Second order	Oct. 1, 1872	Oct. 1, 1872		Closed from July 25, 1876, to October 24, 1887.
Louisa	River	July 1, 1887	July 1, 1887		
Louisville	Second order	Sept. 11, 1871	Sept. 11, 1871		
Paducah	River	May 1, 1873	July 1, 1873		
Williamsburgh	Rainfall	July 1, 1887	Oct. 15, 1887		
Louisiana:					
Alexandria	River	July 14, 1881	Sept. 1, 1881		Also cotton region.
Amite City	Cotton region	Mar. 24, 1882	Apr. 1, 1882		
Cheneyville	....do	Apr. 1, 1882	....do	Nov. 30, 1889	
Coushatta Chute	River	July 14, 1881	Sept. 1, 1881		Do.
Delhi	....do.	Jan. 30, 1885	May 1, 1885		
Franklin	Cotton region	—— ?, 1881	Apr. 1, 1882	Oct. 31, 1883	
Girard	River	Jan. 30, 1885	Feb. 16, 1886		
La Fayette	Cotton region	July 14, 1881	Sept. 1, 1881		Formerly Vermillionville; name changed June 1, 1884.
Minden	....do	Feb. —, 1884	Apr. 1, 1884		
Monroe	River	July 14, 1881	Oct. 1, 1881		Also cotton region.
Morgan City	Cotton region	....do	Sept. —, 1881	Oct. 31, 1883	
Natchitoches	....do	....do	Sept. 1, 1881		
New Iberia	....do	—— ?, 1881	Apr. 1, 1882	Sept. 30, 1883	
New Orleans	First order	Nov. 1, 1870	Nov. 1, 1870		
Opelousas	Cotton region	Feb. 25, 1884	Apr. 1, 1884	Oct. 31, 1887	
Port Eads	Second order	Oct. 10, 1878	Apr. 10, 1881		Closed from April 1, 1883, to August, 1888.
Shreveport	....do	Sept. 3, 1871	Sept. 3, 1871		
Terre Bonne	Cotton region	—— ?, 1881	Apr. 1, 1882	Oct. 31, 1883	
West Melville	River	July 1, 1885	Nov. 1, 1885		
Whiteville	Cotton region	—— ?, 1881	Apr. 1, 1882	May 31, 1885	

LIST OF REGULAR AND SPECIAL STATIONS OF THE SIGNAL SERVICE ESTABLISHED SINCE NOVEMBER 1, 1870, ETC.—Continued.

State and station.	Class.	Established.	Observations began.	Closed.	Remarks.
Maine:					
Eastport	First order	Apr. 1, 1873	Apr. 1, 1873	....	
Green Mountain	Second order	July 1, 1889	July 9, 1889	....	Open during summer months only.
Portland	....do	Jan. 15, 1871	Jan. 15, 1871	....	
Maryland:					
Baltimore	Second order	Jan. 1, 1871	Jan. 1, 1871	....	
Ocean City	Third order	Jan. 13, 1880	Aug. 1, 1882	June 19, 1887	
Massachusetts:					
Boston	First order	Nov. 1, 1870	Nov. 1, 1870	....	
Cottage City	Third order	Feb. 4, 1886	Apr. 13, 1886	Nov. 1, 1886	
Edgartown	....do	Apr. 13, 1886	Aug. 14, 1886	June 1, 1888	
Nantucket	Second order	Feb. 4, 1886	Oct. 18, 1886	....	
Provincetown	....do	Sept. 1, 1879*	Feb. 15, 1882	Mar. 31, 1884	
Springfield	....do	July 19, 1873	Nov. 1, 1874	Dec. 31, 1882	
Thatcher's Island	....do	Sept. 3, 1874	Dec. 26, 1875	Feb. 13, 1885	Third order from June 1, 1883.
Vineyard Haven	Third order	Nov. 1, 1886	Nov. 6, 1886	....	
Wood's Holl	Second order	Jan. 1, 1873	Jan. 1, 1873	....	Closed from February 1, 1882, to November 4, 1886; third order part of 1886 and 1887.
Michigan:					
Alpena	Second order	Sept. 10, 1872	Sept. 10, 1872	....	
Detroit	First order	Nov. 1, 1870	Nov. 1, 1870	....	
Escanaba	Second order	May 24, 1871	May 24, 1871	....	Third order since April 1, 1888.
Grand Haven	....do	....do	....do	....	
Lansing	....do	Oct. 25, 1886	Jan. 1, 1887	....	
Mackinaw City	....do	Oct. 4, 1878*	Aug. 20, 1882	Mar. 31, 1888	
Manistee	....do	Nov. 1, 1880*	July 1, 1888	....	
Marquette	....do	May 9, 1871	May 11, 1871	....	
Port Huron	....do	July 14, 1874	July 25, 1874	....	
Sault de Ste. Marie	....do	July 1, 1877	Aug. 5, 1877	....	Sunset to September 30, 1880; closed from October 1, 1880, to June 30, 1888.
Minnesota:					
Alexandria	Rainfall	July 1, 1887	Aug. 15, 1887	....	
Breckenridge	Second order	Apr. 10, 1872	Apr. 10, 1872	Nov. 30, 1880	
Duluth	First order	Nov. 1, 1870	Nov. 1, 1870	....	
Fergus Falls	Rainfall	July 1, 1887	Aug. 13, 1887	....	
Moorhead	Second order	Dec. 15, 1880	Jan. 1, 1881	....	

Ortonville	*Rainfall*	*July 1, 1887*	*Aug. 15, 1887*		
Redwood Falls	*do*	*do*	*Aug. 16, 1887*		
Rip'ey Fort	*do*	*do*	*Aug. 13, 1887*		
St. Paul	First order	Nov. 1, 1870	Nov. 1, 1870		
St. Vincent	Second order	Aug. 15, 1880	Sept. 5, 1880		
Tracy	Rainfall	July 1, 1887	Aug. 23, 1887		
Wabasha	River	Mar. 7, 1885	Apr. 10, 1885	Sept. 30, 1888	
Wadena	Sunset	July 1, 1877	Aug. 17, 1877	Sept. 30, 1880	
Mississippi:					
Aberdeen	Cotton region	Mar. 28, 1882	Apr. 1, 1882		
Batesville	do	July 14, 1881	Sept. 26, 1881		
Brookhaven	do	Apr. 1, 1882	Apr. 1, 1882		
Columbus	do	July 14, 1881	Sept. 10, 1881		
Corinth	do	do	Sept. 14, 1881		
Edwards	do	Mar. 27, 1882	Apr. 1, 1882		
Grenada	do	July 14, 1881	Sept. 27, 1881	Oct. 31, 1887	
Hazlehurst	do	Feb. 25, 1884	Apr. 1, 1884		
Hernando	do	July 14, 1881	Sept. 25, 1881		
Holly Springs	do	Feb. 25, 1884	Apr. —, 1884		
Jackson	do	Mar. 26, 1882	Apr. 1, 1882		
Lake	do	Mar. 28, 1882	do		
Macon	do	Oct. 28, 1881	Oct. 29, 1881		
Meridian	Second order	July 14, 1881	Sept. —, 1881		Cotton region until August 28, 1889.
Natchez	Cotton region	Feb. 25, 1884	Apr. 1, 1884		
Okolona	do	July 14, 1881	Oct. 17, 1881		
Pass Christian	do	do	Sept. —, 1881		
Port Gibson	do	June 12, 1885	June 16, 1885		
Scranton	do	Mar. —, 1882	Apr. 1, 1882	Oct. 31, 1883	
Starkville	do	Feb. 9, 1882	May 4, 1882	June 15, 1883	
State Line	Second order	July 14, 1881	Sept. 17, 1881	Oct. 31, 1883	
University (Oxford)	Cotton region	Oct. 25, 1886	June 1, 1887		
Vicksburg	Second order	Sept. 10, 1871	Sept. 10, 1871		Third order since April 1, 1888.
Waynesborough	do	July 14, 1881	Sept. 17, 1881		
Yazoo City	Cotton region	May 11, 1885	Oct. 16, 1885		
	River				
Missouri:					
Boonville	River	Apr. 28, 1873	Nov. 16, 1873		
Brunswick	do	May 1, 1873	May 1, 1873	Dec. 31, 1885	
Columbia	Third order	Aug. 3, 1889	Aug. 21, 1889		
Hermann	River	Apr. 24, 1873	Apr. 24, 1873		
Jefferson City	do	May 12, 1873	May 12, 1873	Jan. 31, 1885	

* As special display.

LIST OF REGULAR AND SPECIAL STATIONS OF THE SIGNAL SERVICE ESTABLISHED SINCE NOVEMBER 1, 1870, ETC.—Continued.

State and station.	Class.	Established.	Observations began.	Closed.	Remarks.
Missouri—Continued.					
Jerome	River	Mar. 7, 1885	May 7, 1885		Also known by the name of Arlington.
Kansas City	First order		Apr. 21, 1873		River until July 1, 1888.
Lamar	Second order	Oct. 17, 1884	Feb. 26, 1885	Dec. 31, 1888	
Lexington	River	Apr. 28, 1873	Apr. 28, 1873	Mar. 31, 1885	
Louisiana	....do	Mar. 7, 1885	Apr. 1, 1885		
St. Joseph	....do	May 8, 1873	June 22, 1873		
St. Louis	First order	Nov. 1, 1870	Nov. 1, 1870		
Springfield	Second order	Oct. 12, 1881	June 3, 1882		Closed from June 15, 1883, to July 1, 1887.
Montana:					
Assinniboine, Fort	Second order	Oct. 6, 1879	Aug 1, 1880		
Benton, Fort	....do	Nov. 25, 1871	Nov. 26, 1871	Dec. 8, 1886	Closed from August 1, 1876, to July 1, 1880.
Billings	....do	June 9, 1882	Jan. 1, 1883	June 24, 1883	
Cartersville	Third order	Apr. 1, 1882	Apr. 1, 1882	June 15, 1883	
Custer, Fort	Second order	Dec. 5, 1878	Aug. 12, 1879		Third order from January 1, 1883, to July 20, 1883.
Custer Station	Third order	Dec. 28, 1878	Apr. —, 1881		Terry's Landing (rainfall observations only).
Deer Lodge	....do	Dec. 8, 1879	Mar. 1, 1881	June 30, 1883	
Foley	....do	July 7, 1881	Feb. 5, 1882	Apr. —, 1882	
Galpin	Repair	Oct. 9, 1882	Apr. 20, 1888	June 30, 1890	
Glendive	Third order	July 19, 1880	Mar. 1, 1882	June 15, 1883	
Helena	Second order	Oct. 15, 1879	Apr. 1, 1880		
Keogh, Fort	....do	Nov. 18, 1878	Jan. 13, 1879	June 15, 1883	
Kintyre	Repair	Apr. 1, 1889	July 1, 1889	June 30, 1890	
Maginnis, Fort	Second order	May 17, 1882	July 14, 1882	....do	Third order from July 1, 1889.
Missoula, Fort	....do	Dec. 15, 1879	June 5, 1880	June 15, 1883	
New Chicago	Third order	Jan. 19, 1880	Mar. 1, 1881	June 30, 1883	
Poplar River	Second order	Sept. 17, 1881	May 1, 1882	Mar. 31, 1889	
Rock Creek	Third order	Dec. 18, 1879	July 1, 1881	Mar. 31, 1882	
Shaw, Fort	Second order	July 1, 1877	Sept. 2, 1877	Oct. 9, 1886	Sunset to February 2, 1878; no observations February 1878, to April 1, 1880.
Virginia City	....do	Nov. 25, 1871	Nov. 25, 1871	Nov. 18, 1880	
Nebraska:					
Central City	Sunset	July 1, 1877	Aug. 2, 1877	May 29, 1880	

Crete	*Second order*	*July 1, 1887*	*July 12, 1887*		*Third order January 1, 1889.*
Culbertson	*Rainfall*	*....do*	*July 1, 1887*		
North Platte	Second order	Sept. 18, 1874	Sept. 18, 1874		
Omaha	....do	Nov. 1, 1870	Nov. 1, 1870		
Plattsmouth	River	Apr. 20, 1873	Apr. 19, 1873		
Robinson, Fort	Third order	May 1, 1885	Apr. 1, 1888	Oct. 15, 1888	
Sidney	Sunset	July 1, 1877	Dec. 30, 1877	Sept. 30, 1880	
Valentine	Second order	Jan. 27, 1885	Sept. 1, 1885		
Nevada:					
Austin	Sunset	July 1, 1877	Aug. 19, 1877	Oct. 2, 1880	
Carson City	Second order	Aug. 1, 1887	Dec. 1, 1887		
Hamilton	Sunset	July 1, 1877	Aug. 1, 1877	Sept. 25, 1880	
Pioche	Second order	May 21, 1877	July 29, 1877	June 15, 1883	
Winnemucca	....do	....do	July 1, 1877		Closed June 15, 1883, to December 1, 1884.
New Hampshire:					
Manchester	Second order	Nov. 13, 1886	Mar. 1, 1887		
Mount Washington	....do	Dec. 1, 1870	Dec. 15, 1870		Maintained May to September, inclusive, only, after September, 1887.
New Jersey:					
Atlantic City	Second order	Dec. 10, 1873	Dec. 10, 1873		
Barnegat City	....do	....do	....do	Dec. 31, 1885	
Belvidere	Sunset		Dec. 29, 1878	Aug. 31, 1881	
Cape May	Second order	May 24, 1871	May 24, 1871	Oct. 31, 1885	
Elizabeth	Sunset		Dec. 1, 1878	Nov. 30, 1881	
Flemington	....do		....do	July 2, 1881	
Freehold	....do		....do	Aug. 31, 1881	
Linden	....do		Sept. 1, 1881	Sept. 30, 1881	
Little Egg Harbor	Third order	Jan. 20, 1879	Apr. 9, 1882	Dec. 31, 1885	
Long Branch	Second order	Dec. 10, 1873	Dec. 10, 1873	July 8, 1876	
New Brunswick	....do		Nov. 23, 1878		Sunset to September 18, 1880; closed till October 1, 1887; only 2½ months' record as second order, in 1887.
Peck's Beach	....do	Dec. 10, 1873	Dec. 10, 1873	Feb. 23, 1876	
Sandy Hook	....do	....do	....do	Nov. 13, 1886	Now special display, making continuous record of wind velocity.
Somerville	Sunset		Nov. 18, 1878	Dec. 20, 1879	
Squan Beach	Second order	Dec. 10, 1873	Dec. 10, 1873	Feb. 26, 1876	
New Mexico:					
Albuquerque	Third order	July 1, 1876	Oct. 1, 1878	May 23, 1881	Closed October 18, 1879, to March 1, 1881.
Bayard, Fort	Second order	Feb. 16, 1876	Aug. 9, 1877	Oct. 31, 1883	

LIST OF REGULAR AND SPECIAL STATIONS OF THE SIGNAL SERVICE ESTABLISHED SINCE NOVEMBER 1, 1870, ETC.—Continued.

State and station.	Class.	Established.	Observations began.	Closed.	Remarks.
New Mexico—Continued.					
Craig, Fort	Second order		May 21, 1877	Dec. 21, 1884	Closed June 27, 1879, to February 16, 1881, and from April 20, 1881, to December 8, 1881.
Cummings, Fort	Third order	June 1, 1878	Feb. 1, 1881	Feb. 28, 1881	
La Mesilla	Second order	July 16, 1876	Aug. 5, 1877	Aug. 6, 1882	
Lava	Third order	Dec. 5, 1884	Dec. 21, 1884		
Santa Fé	First order	Nov. 20, 1871	Nov. 20, 1871		Closed June 15, 1883, to December 1, 1884.
Silver City	Second order	July 1, 1876	May 16, 1878	Mar. 31, 1883	
Shakespeare	Third order	Nov. 20, 1879	Feb. 1, 1881	Aug. 31, 1881	
Socorro	Second order	Jan. 1, 1877	July 1, 1879	May 23, 1881	
Springer	Rainfall	July 1, 1887	Aug. 6, 1887		
Stanton, Fort	Second order	Nov. 1, 1879	Jan. 1, 1884		Third order to October 31, 1885.
New York:					
Albany	Second order	Dec. —, 1873	Dec. 22, 1873		
Buffalo	First order	Nov. 1, 1870	Nov. 1, 1870		
Elmira	Sunset	July 1, 1877	Feb. 24, 1878	Aug. 23, 1879	
Malone	Second order	Aug. 1, 1875	Aug. 1, 1875	Apr. 30, 1877	
New York City	First order	Nov. 1, 1870	Nov. 1, 1870		
Oswego	Second order	....do	....do		
Rochester	....do	....do	....do		Closed June 15, 1883, to October 10, 1883.
North Carolina:					
Asheville	Rainfall	July 1, 1887	Jan. 28, 1888		
Cape Hatteras	Second order	Aug. 18, 1874	Sept. 1, 1874	Dec. 1, 1880	Moved to Hatteras.
Cape Lookout	....do	Mar. 8, 1876	May 14, 1876	July 31, 1885	Third order September 1, 1883, to July 31, 1885; closed November 22, 1883, to February 1, 1885.
Charleston	Rainfall	July 1, 1887	Sept. 1, 1887		
Charlotte	Second order	Oct. 6, 1878	Oct. 6, 1878		
Currituck Inlet	Repair	Nov. 4, 1889	Dec. 1, 1889		
Goldsborough	Cotton region	July 14, 1881	Sept. 22, 1881		
Hatteras	Second order	Dec. 1, 1880	Dec. 1, 1880		
Kitty Hawk	....do	Jan. 15, 1875	Jan. 15, 1875		Third order since January 1, 1887.
Lumberton	Cotton region	Aug. 29, 1881	Sept. 22, 1881		

Macon, Fort	Second order	Apr. 2, 1878	Apr. 19, 1878	Dec. 13, 1886	
Mount Holly	River	July 1, 1885	Sept. 26, 1885	....	
Mount Mitchell	Second order	May 11, 1873	May 11, 1873	Sept. 6, 1873	
Murphy	Rainfall	July 1, 1887	Jan. 7, 1888	....	
New Berne	Cotton region	Feb. 25, 1884	Apr. 12, 1884	....	
New River Inlet	Third order	May 18, 1876	Aug. 3, 1882	Dec. 31, 1886	
Ogreeta	Sunset	Oct. 1, 1881	Apr. —, 1883	Nov. —, 1883	
Portsmouth	Second order	Apr. 23, 1876	May 9, 1876	Aug. 31, 1885	Third order August 1, 1883, to August 31, 1885; no observations December 8, 1883, to February 1, 1885.
Raleigh	....do	Feb. 25, 1884	Apr. 1, 1884	....	Cotton region to December, 1886.
Salisbury	Cotton region	Mar. 18, 1882	Apr. 1, 1882	Oct. 31, 1887	
Scott's Hill	Third order	May 23, 1878	Sept. 7, 1882	May 31, 1885	
Southport	Second order	Sept. 27, 1875	Sept. 27, 1875	....	Third order since November 1, 1886.
Wadesborough	Cotton region	Aug. 30, 1881	Sept. 22, 1881	....	
Wash Woods	Third order	Mar. 6, 1878	May 12, 1882	May 1, 1888	
Weldon	Cotton region	July 14, 1881	Sept. 23, 1881	....	
Wilmington	Second order	Jan. 1, 1871	Jan. 1, 1871	....	
North Dakota:					
Bismarck	Second order	Sept. 15, 1874	Sept. 15, 1874	....	
Buford, Fort	....do	Oct. 23, 1878	Jan. 13, 1879	....	
Pembina	....do	Nov. 1, 1872	Nov. 1, 1872	Sept. 3, 1886	
Stevenson, Fort	....do	Sept. 19, 1878	Dec. 26, 1878	June 15, 1883	
Tobacco Garden	Third order	Sept. 9, 1880	Feb. 1, 1882	....do	
Totten, Fort	Second order	Oct. 8, 1883	Dec. 15, 1883	Jan. 31, 1889	Third order to June 8, 1884.
Yates, Fort	Third order	Sept. 5, 1879	Sept. 1, 1882	....	
Ohio:					
Caledonia	Rainfall	July 1, 1887	July 30, 1887	....	
Canton	....do	....do	July 1, 1887	....	
Cincinnati	First order	Nov. 1, 1870	Nov. 1, 1870	....	
Circleville	River	July 1, 1887	Sept. 1, 1887	....	
Cleveland	First order	Nov. 1, 1870	Nov. 1, 1870	....	
Columbus	Second order	July 1, 1878	July 1, 1878	....	
Gallipolis	River	July 1, 1887	Aug. 1, 1887	Aug. 31, 1889	
Kenton	Rainfall	....do	....do	....	
Mansfield	....do	....do	....do	....	
Marietta	River	Apr. 19, 1873	Apr. 17, 1873	....	
Portsmouth	....do	July 1, 1887	July 1, 1887	....	
Sandusky	Second order	Aug. 2, 1877	Aug. 2, 1877	....	Closed March 31, 1883, to July 20, 1883.
Sidney	Rainfall	July 1, 1887	Aug. 1, 1887	....	

LIST OF REGULAR AND SPECIAL STATIONS OF THE SIGNAL SERVICE ESTABLISHED SINCE NOVEMBER 1, 1870, ETC.—Continued.

State and station.	Class.	Established.	Observations began.	Closed.	Remarks.
Ohio—Continued.					
Toledo	Second order	Nov. 1, 1870	Nov. 1, 1870		
Wooster	Rainfall	July 1, 1887	July 1, 1887		
Zanesville	River	....do	Aug. 1, 1887		
Oregon:					
Albany	River	Nov. 24, 1878	Nov. 24, 1878	Apr. 30, 1888	
Ashland	Third order	Dec. 9, 1881	Dec. 17, 1883	Oct. 31, 1889	
Astoria	Second order	Mar. 22, 1883	Nov. 1, 1883		Third order since October 1, 1888.
Baker City	....do	July 1, 1889	July 9, 1889		
Bly	Repair	Aug. 4, 1886	Mar. 24, 1888	Sept. 30, 1888	
Eugene City	River	July 1, 1877	Sept. 11, 1877	Apr. 30, 1888	Sunset to October 2, 1880.
Klamath, Fort	Third order	Dec. 9, 1881	Nov. 23, 1883	Oct. 31, 1889	
Lake View	....do	Sept. 13, 1882	Nov. 17, 1883	Nov. 10, 1888	
Linkville	....do	Dec. 25, 1881	Nov. 10, 1883	Oct. 31, 1889	
Parker's	Repair	....do	Apr. 1, 1888	....do	Rainfall observations.
Portland	First order	Nov. 1, 1870	Nov. 1, 1870		
Roseburgh	Second order	May 21, 1877	July 15, 1877		
Stevens, Fort	Third order	Mar. 22, 1883	Oct. 1, 1883	Dec. 5, 1883	
Umatilla	Second order	May 21, 1877	July 15, 1877	Feb. 28, 1887	River from April 1, 1883.
Pennsylvania:					
Brookville	River	Nov. 19, 1884	Dec. 8, 1884		
Brownsville	....do	June 6, 1873	June 7, 1873	Nov. 30, 1885	
Clarion	....do	Nov. 19, 1884	Nov. 17, 1884		
Confluence	....do	Apr. 23, 1873	Apr. 23, 1873		
Erie	Second order	May 25, 1873	May 25, 1873		
Freeport	River	Apr. 17, 1873	Apr. 16, 1873		
Greensborough	....do	July 1, 1888	Oct. 1, 1888		
Harrisburg	Second order	....do	July 1, 1888		
Johnstown	River	Nov. 19, 1884	Jan. 2, 1885		
Lock No. 4	....do	Dec. 1, 1885	Dec. 9, 1885		
Mahoning	....do	Oct. 20, 1883	Oct. 27, 1884		
New Geneva	....do	Apr. 24, 1873	Apr. 23, 1873	June 30, 1888	
Oil City	....do	Apr. 20, 1873	June 3, 1873		
Parker's Landing	....do	Nov. 19, 1884	Jan. 1, 1885		

Philadelphia	*First order*	*Jan. 1, 1871*	*Jan. 1, 1871*		
Pittsburgh	*....do*	*Nov. 1, 1870*	*Nov. 1, 1870*		
Saltsburgh	River	Oct. 20, 1883	Jan. 1, 1884		
Warren	....do	Nov. 19, 1884	Jan. 6, 1885		
Williamsport	Second order	Oct. 12, 1881	Jan. 1, 1882	June 15, 1883	
Rhode Island:					
Block Island	Second order	July 1, 1880	Sept. 1, 1880		
Narragansett Pier	Third order		Apr. 1, 1882		
Newport	Second order	July —, 1875	Aug. 1, 1875	Mar. 31, 1883	
Point Judith	Third order	June 29, 1880	Oct. 13, 1882	Oct. 31, 1885	
South Carolina:					
Allendale	Cotton region	Apr. 1, 1882	Apr. 1, 1882		
Anderson	....do	Apr. 19, 1884	May 24, 1884	Oct. 31, 1887	
Batesburgh	....do	May 23, 1884	June 1, 1884		
Blackville	....do	May 24, 1884	....do		
Branchville	....do	July 14, 1881	Sept. 5, 1881		
Charleston	Second order	Jan. 5, 1871	Jan. 5, 1871		
Cheraw	Cotton region	Mar. 17, 1882	Apr. 1, 1882		
Chester	....do	July 14, 1881	Sept. 2, 1881		
Columbia	Second order	Sept. —, 1881	Sept. —, 1881		Cotton region to August 31, 1887; now third order.
Florence	Cotton region	Mar. 25, 1882	Apr. 1, 1882		
Greenville	....do	July 14, 1881	Sept. 1, 1881		
Greenwood	....do	May 21, 1884	June 1, 1884		
Hardeeville	....do	Mar. —, 1882	Apr. 8, 1882		
Jacksonborough	....do	....do	Apr. 7, 1882		
Kingstree	....do	....do	Apr. 6, 1882		
St. George's	....do	....do	Apr. 4, 1882		
St. Matthew's	....do	....do	Apr. 5, 1882		
Spartanburgh	....do	July 14, 1881	Sept. 1, 1881		
Yemassee	....do	....do	....do		
South Dakota:					
Bennett, Fort	Second order	Dec. 22, 1879	Sept. 7, 1880	Nov. 30, 1885	
Deadwood	....do	July 1, 1877	Sept. 3, 1877	Dec. 31, 1887	Sunset to December 13, 1877; closed May 31, 1878, to November 1, 1878.
Huron	....do	Apr. 23, 1881	July 1, 1881		
Lead City	....do	June 1, 1878	June 1, 1878	Oct. 31, 1878	
Meade, Fort	Third order	Feb. 19, 1879	Apr. 1, 1881	Oct. 31, 1883	
Rapid City	Second order	Jan. 19, 1880	Jan. 24, 1881		Closed June 18, 1883, to January 1, 1888; third order to June 18, 1883.
Smithville	Third order	June 18, 1880	June 1, 1881	June 15, 1883	

LIST OF REGULAR AND SPECIAL STATIONS OF THE SIGNAL SERVICE ESTABLISHED SINCE NOVEMBER 1, 1870, ETC.—Continued.

State and station.	Class.	Established.	Observations begun.	Closed.	Remarks.
South Dakota—Continued:					
Sully, Fort	Second order	May 1, 1872	May 7, 1872		No observations November 1, 1877, to July 31, 1881. Third order August 1, 1881, to November 30, 1885.
Yankton	...do	Mar. 11, 1873	Apr. 1, 1873		
Tennessee:					
Arlington	Cotton region	(?) 1881	Apr. 1, 1882		Formerly Withe.
Bolivar	...do	Mar. 29, 1884	Apr. 1, 1884		
Brownsville	...do	July 14, 1881	Oct. 8, 1881		
Carthage	River	Dec. 1, 1884	Feb. 10, 1885		
Charleston	...do	Dec. 1, 1883	Dec. 1, 1884		
Chattanooga	Second order	Sept. 12, 1875	Sept. 12, 1875		River to January 8, 1879.
Clarksville	Cotton region	July 14, 1881	Oct. 8, 1881	Oct. 31, 1883	
Clinton	River	Dec 1, 1883	Dec. 1, 1884		
Columbia	...do	Nov. 1, 1886	Jan. 19, 1887		
Covington	Cotton region	Feb. 25, 1884	Apr. 1, 1884		
Dyersburgh	...do	...do	...do		
Erin	...do	July 14, 1881	Oct. 7, 1881	Oct. 31, 1884	
Grand Junction	...do	...do	Sept. 12, 1881		
Johnsonville	River	Oct. 1, 1875	Oct. 1, 1875		
Kingston	...do	Dec. 1, 1883	Dec. 1, 1884		
Knoxville	Second order	Jan. 1, 1871	Jan. 20, 1871		
Leadvale	River	Dec. 1, 1883	Dec. 1, 1884	Mar. 30, 1886	
Loudon	...do	...do	...do		
Memphis	First order	Feb. 28, 1871	Feb. 28, 1871		
Milan	Cotton region	July 14, 1881	Oct. 6, 1881		
Nashville	Second order	Nov. 1, 1870	Nov. 1, 1870		
Paris	Cotton region	Sept. ?, 1881	Apr. 1, 1882	Oct. 31, 1887	
Rockwood	River	Dec. 1, 1883	Dec. 1, 1884		
Rogersville	Rainfall	July 1, 1887	Aug. 1, 1887		
Strawberry Plains	River	Dec. 1, 1883	Feb. 1, 1885		
Texas:					
Abilene	Second order	Sept. 1, 1885	Sept. 14, 1885		
Austin	Cotton region	July 14, 1881	Apr. 1, 1882	Oct. 31, 1887	
Beaumont	...do	(?) 1881	...do	July 21, 1885	

Belton	....*do*	*July 14, 1881*	....*do*		
Boerne	Second order	May 6, 1876	Aug. 27, 1876	July 28, 1880	
Brackettsville	....do	Sept. 1, 1875	May 2, 1876	Dec. 16, 1881	Fort Clark.
Brenham	Cotton region	July 8, 1885	Aug. 31, 1885		
Brownsville	Second order	Aug. 25, 1875	Nov. 13, 1875		
Cambridge	Third order	June 17, 1875	Feb. 21, 1877	Jan. 5, 1878	
Castroville	Second order	Sept. 29, 1875	Aug. 1, 1877	Mar. 29, 1882	
Coleman City	....do	Apr. 1, 1877	July 1, 1877	Sept. 5, 1883	
Columbia	Cotton region	Feb. 25, 1884	May 22, 1884		
Concho, Fort	Second order	Oct. 10, 1875	Apr. 1, 1877	Sept. 15, 1885	
Corpus Christi	....do	Oct 1, 1886	Feb. 1, 1887		
Corsicana	....do	Sept. 1, 1874	Sept. 15, 1874		Cotton region since April 1, 1882.
Cuero	Cotton region	(?)	Aug. 7, 1882		
Dallas	....do	July 14, 1881	Apr. 1, 1882		
Davis, Fort	Second order	Dec. 24, 1877	Apr. 1, 1878	Dec. 31, 1888	
Decatur	....do	Feb. 1, 1876	Jan. 20, 1878	Sept. 10, 1882	
Denison	....do	Dec. 16, 1874	July 19, 1875	Mar. 31, 1883	
Eagle Pass	....do	Jan. 19, 1875	Feb. 15, 1876	June 15, 1883	
Edinburgh	....do	Sept. 12, 1875	May 27, 1877		(Hidalgo.) No observations February, 1882, to February 28, 1888. Now a repair station; reporting rainfall.
Elliott, Fort	....do	Nov. 29, 1879	Nov. 28, 1879		
El Paso	....do	Nov. 5, 1877	Apr. 1, 1878		
Fredericksburgh	....do	Mar. 14, 1876	Apr. 1, 1877	Feb. 25, 1883	
Galveston	First order	Apr. 19, 1871	Apr. 19, 1871		
Graham	Second order	June 16, 1876	Mar. 4, 1877	June 15, 1883	No observations January 1, 1880, to December 31, 1880. Third order from January 1, 1881.
Grierson Springs	Third order	July 9, 1879	Jan. 25, 1881	Sept. 23, 1882	No observations.
Griffin, Fort	Second order	July 1, 1875	Apr. 15, 1877	Apr. 14, 1882	
Hearne	Cotton region	July 14, 1881	Apr. 1, 1882		
Hempstead	....do	....do	....do	Sept. 30, 1884	
Henrietta	Second order	Feb. 1, 1877	Feb. 13, 1878	Mar. 31, 1883	
Houston	Cotton region	July 14, 1881	Apr. 1, 1882		
Howe	....do	June 1, 1890	No report		
Huntsville	....do	Sept. 12, 1881	Apr. 1, 1882		
Indianola	Second order	May 1, 1872	May 1, 1872	Aug. 20, 1886	
Jacksborough	....do	May 8, 1875	Sept. 1, 1877	June 15, 1883	
Laredo	....do	Dec. 16, 1875	Aug. 6, 1876	Dec. 16, 1881	
Longview	Cotton region	July 14, 1881	Apr. 1, 1882		

State and station.	Class.	Established.	Observations began.	Closed.	Remarks.
Texas—Continued.					
Luling	Cotton region	July 14, 1881	Apr. 1, 1882		
Mason	Second order	Feb. 8, 1876	Apr. 29, 1877	June 8, 1883	
McKavett, Fort	...do	Oct. 19, 1875	Sept. 23, 1877	...do	
Miami	Repair	Dec. 19, 1887	Mar. 6, 1888		
Orange	Cotton region	July 14, 1881	Sept. 1, 1881		
Palestine	Second order	Oct. 12, 1881	Dec. 3, 1881		
Paris	Cotton region	Mar. 26, 1882	Apr. 1, 1882		
Pilot Point	Second order	June 18, 1875	Aug. 5, 1877	Apr. 1, 1881	
Rio Grande City	...do	May 27, 1875	Mar. 12, 1876		No observations August 27, 1876, to December 31, 1876, and January 20 to March 6, 1878; closed October 1, 1882, to February 18, 1883. Third order February 19 to September 30, 1883.
San Antonio	...do	Sept. 22, 1875	Jan. 2, 1876		Closed June 15, 1883, to December 31, 1884.
Santa Maria	Third order	Apr. 25, 1878	Jan. 17, 1881		Now repair; reporting rainfall.
Sour Lake	Cotton region	Mar. 21, 1882	Apr. 1, 1882	Oct. 31, 1888	
Stockton, Fort	Second order	Feb. 26, 1876	Jan, 1, 1877	June 30, 1886	
Tyler	Cotton region	July 14, 1881	Apr. 1, 1882		
Uvalde	Second order	Sept. 6, 1875	May 20, 1877	June 15, 1883	Third order from November 1, 1882.
Waco	Cotton region	July 14, 1881	Apr. 1, 1882		
Weatherford	...do	...do	...do		
Weimar	...do	...do	...do		
Utah:					
Brock	Third order	Nov. 11, 1887	Mar. 10, 1888	June 30, 1889	
Corinne	Second order	Feb. 2, 1871	Feb. 2, 1871	Mar. 14, 1874	
Deep Creek	Sunset	July 1, 1877	Aug. 28, 1877	Oct. 2, 1880	
Du Chesne, Fort	Second order	Sept. 1, 1887	Dec. 1, 1887		
Fillmore City	Sunset	July 1, 1877	Aug. 4, 1877	Sept. 30, 1880	
Frisco	Second order	Jan. 27, 1885	June 22, 1885	Dec. 31, 1887	
Price	Repair	Sept. 1, 1887	Mar. 11, 1888		
St. George	Sunset	July 1, 1877	Aug. 5, 1877	Sept. 30, 1880	
Salt Lake City	First order	Mar. 14, 1874	Mar. 19, 1874		

Taylor's Ranch	*Third order*	*July 1, 1889*	*July 1, 1889*		
Thornburg, Fort	....*do*	*July 1, 1883*	*Aug. 6, 1883*	Nov. 15, 1884	
Vermont:					
Burlington	Second order	May 24, 1871	May 24, 1871	June 15, 1883	
Mount Killington	....do	July 1, 1889	July 13, 1889		Maintained during summer months only.
Northfield	....do	Nov. 13, 1886	Mar. 1, 1887		
Virginia:					
Abingdon	Rainfall	July 1, 1887	Aug. 13, 1887		
Cape Henry	Second order	Dec. 9, 1873	Dec. 9, 1873		Third order January 1, 1887.
Chincoteague	....do	Mar. 16, 1880	Mar. 16, 1880	June 18, 1887	
Christiansburgh	Rainfall	July 1, 1887	July 1, 1887		
Lynchburgh	Second order	May 24, 1871	May 24, 1871		
Norfolk	....do	Jan. 1, 1871	Jan. 1, 1871		
Wytheville	....do	Jan. 16, 1873	Jan. 16, 1873	July 31, 1876	
Washington:					
Almota	Third order	June 28, 1880	Mar. 1, 1880	June 22, 1883	
Canby, Fort	Second order	Sept. 1, 1883	Sept. 1, 1883		
Colfax	Third order	July 9, 1880	Feb. 1, 1881	June 15, 1883	
Dayton	Second order	May 6, 1879	Dec. 1, 1879	Nov. 30, 1885	
Neah Bay	Third order	Mar. 14, 1883	Dec. 1, 1883		Closed March to August 31, 1887.
Olympia	Second order	May 21, 1877	July 1, 1877		
Point Roberts	Sunset		Mar. 13, 1881	Apr. 30, 1882	
Pomeroy	Third order	May 23, 1879	May 1, 1881	June 27, 1883	
Port Angeles	Second order	Nov. 7, 1882	Nov. 1, 1883		Third order to January 31, 1885.
Pysht	Third order	Feb. 1, 1883	Dec. 1, 1883	Nov. 30, 1889	
Spokane Falls	Second order	Aug. 4, 1880	Feb. 1, 1881		
Spokane, Fort	Third order	May 16, 1882	Oct. 1, 1883	Aug. 28, 1887	
Tatoosh Island	Second order	Sept. 1, 1883	....do		Third order since April 12, 1889.
Walla Walla	....do	Dec. 1, 1885	Dec. 1, 1885		
West Virginia:					
Buckhannon	Rainfall	July 1, 1887	Aug. 13, 1887		
Charleston	River	....do	July 1, 1887		
Glenville	Rainfall	....do	Aug. 1, 1887		
Harper's Ferry	River	(?)	Aug. 1, 1889		Prior to August 1, 1889, reported by telegraph during freshets.
Hinton	....do	July 1, 1887	July 1, 1887		
Morgantown	Second order	Jan. 25, 1873	Jan. 25, 1873		River since April, 1883.
Parkersburgh	....do	July 1, 1888	July 1, 1888		
Point Pleasant	River	Aug. 16, 1889	Aug. 16, 1889		
Rowlesburgh	....do	Nov. 19, 1884	Dec. 8, 1884		

LIST OF REGULAR AND SPECIAL STATIONS OF THE SIGNAL SERVICE ESTABLISHED SINCE NOVEMBER 1, 1870, ETC.—Continued.

State and station.	Class.	Established.	Observations began.	Closed.	Remarks.
West Virginia—Continued.					
Weston	River	Nov. 19, 1884	Oct. 22, 1885		
Wheeling	....do		May 1, 1882		
White Sulphur Springs	Rainfall	July 1, 1887	May 7, 1888		
Wisconsin:					
Chippewa Falls	....do	....do	Aug. 28, 1887		
Green Bay	Second order	Sept. 16, 1877*	Sept. 1, 1886		
La Crosse	....do	Oct. 15, 1872	Oct. 15, 1872		
Madison	....do	Sept. 29, 1878	Sept. 29, 1878	Mar. 31, 1883	
Medford	Rainfall	Apr. 1, 1889	July 1, 1889		
Milwaukee	Second order	Nov. 1, 1870	Nov. 1, 1870		
Phillips	Rainfall	July 1, 1887	Aug. 1, 1887		
Portage	....do	....do	....do		
Rhinelander	....do	....do	Aug. 27, 1887		
Wyoming:					
Bridger, Fort	Second order	July 1, 1883	July 1, 1884	Sept. 15, 1888	Third order to August 1, 1885.
Carter	Third order	Sept. 28, 1883	Mar. 1, 1888	May 1, 1890	
Cheyenne	Second order	Nov. 1, 1870	Nov. 1, 1870		
Crooks	Repair	Dec. 9, 1887	Mar. 15, 1888	Apr. 30, 1888	
Fetterman, Fort	Sunset	July 1, 1877	Aug. 5, 1877	Oct. 23, 1880	
Hat Creek	....do	....do	Oct. 1, 1877	Oct. 2, 1880	
Laramie, Fort	Third order	May 1, 1885	May 1, 1885	May 18, 1889	
McKinney	Second order	July 5, 1887	Dec. 1, 1887		
Rawlins	Third order	Nov. 6, 1882	Sept. 1, 1888		Closed June 30, 1883, to December 5, 1887.
St. Mary's	Sunset	July 1, 1877	Aug. 12, 1877	Sept. 30, 1880	Name changed to Edson May 1, 1880.
Sweetwater Bridge	Repair	May 16, 1888	June 1, 1888	Aug. 12, 1889	Meyersville.
Washakie, Fort	Second order	Dec. 1, 1881	Feb. 15, 1882		Closed June 15, 1883, to January 1, 1888.

* As special display.

APPENDIX 11.

CHANGES IN SIGNAL-SERVICE STATIONS AND ANNUAL METEOROLOGICAL SUMMARIES FOR 1889.

SIGNAL-SERVICE STATIONS, 1889.—LATITUDE, LONGITUDE, ELEVATION OF BAROMETERS, THERMOMETERS, AND RAIN GAUGES, LOCAL TIME, AND CHANGES DURING THE YEAR.

Stations.	Latitude.		Longitude.		Elevation December 31, 1889. Barometer above sea.	Thermometer above ground.	Rain gauge above ground.	Local time, *faster* or *slower* than eastern time.		Changes in elevation of barometers from January 1, 1889, to June 30, 1890.
	°	′	°	′	*Feet.*	*Feet.*	*Feet.*	*h.*	*m.*	
Abilene	32	23	99	40	1,748	64	53	1	39s	
Albany	42	39	73	45	85	84	99	0	5F	
Alpena	45	5	83	30	609	63	54	0	34s	
Assiniboine	48	32	109	42	2,690	16	2	2	19s	
Atlanta	33	45	84	23	1,139	98	94	0	37s	Moved March 15, 1889, from 1,129 feet.
Atlantic City	39	22	74	25	53	68	57	0	3F	Moved April 1, 1889, from 34 feet.
Augusta	33	28	81	54	183	45	40	0	27s	
Baker City	44	50	117	50	3,430	49	38	2	51s	Opened July 10, 1889.
Baltimore	39	18	76	37	76	86	78	0	6s	
Bismarck	46	47	100	38	1,681	16	2	1	42s	
Block Island	41	10	71	36	27	39	33	0	14F	
Boisé City	43	37	116	12	2,750	43	36	2	45s	Closed June 30, 1890.
Boston	42	21	71	4	125	115	174	0	16F	
Brownsville	25	53	97	26	57	17	1	1	30s	
Buffalo	42	53	78	53	690	103	93	0	15s	
Buford	48	0	103	56	1,900	17	3	1	56s	
Cairo	37	0	89	10	359	88	78	0	56s	
Canby	46	16	124	4	179	10	2	3	16s	
Carson City	39	8	119	47	....	21	42	2	59s	
Cedar Keys	29	8	83	3	22	42	33	0	32s	Closed March 31, 1890.
Charleston	32	47	79	56	52	62	55	0	20s	
Charlotte	35	13	80	51	808	56	47	0	23s	

SIGNAL-SERVICE STATIONS, 1889.—LATITUDE, LONGITUDE, ELEVATION OF BAROMETERS, THERMOMETERS, AND RAIN GAUGES, ETC.—Continued.

Stations.	Latitude.		Longitude.		Elevation December 31, 1889. Barometer above sea.	Thermometer above ground.	Rain gauge above ground.	Local time, *faster* or *slower* than eastern time.		Changes in elevation of barometers from January 1, 1889, to June 30, 1890.
	°	′	°	′	*Feet.*	*Feet.*	*Feet.*	*h.*	*m.*	
Chattanooga	35	4	85	15	783	71	60	0	41s	
Cheyenne	41	8	104	48	6,105	58	50	1	59s	
Chicago	41	52	87	38	715	146	134	0	50s	Moved February 1, 1890, to 824 feet.
Cincinnati	39	6	84	30	628	153	145	0	38s	
Cleveland	41	31	81	42	751	118	111	0	27s	Moved October 14, 1889, from 678 feet.
Colorado Springs	38	51	104	47	....	10	2	1	59s	
Columbus	39	58	83	0	837	94	76	0	32s	Moved May 1, 1889, from 812 feet.
Concordia	39	35	97	41	1,410	42	34	1	31s	
Corpus Christi	27	49	97	25	20	43	35	1	30s	
Custer	45	42	107	34	3,040	18	26	2	10s	
Davenport	41	30	90	38	615	72	64	1	2s	Moved April 1, 1890, to 613 feet.
Denver	39	45	105	0	5,281	86	79	2	0s	
Des Moines	41	35	93	37	869	84	75	1	14s	Moved April 1, 1899, from 866 feet.
Detroit	42	20	83	3	662	81	72	0	32s	
Dodge City	37	45	100	0	2,523	44	37	1	40s	
Dubuque	42	30	90	44	651	60	50	1	3s	Moved July 1, 1889, from 665 feet.
Du Chesne	40	35	109	50	4,900	12	4	2	19s	
Duluth	46	48	92	8	670	70	56	1	8s	
Eastport	44	54	66	59	53	51	43	0	32F	
Elliott	35	30	100	21	2,690	14	2	1	41s	
El Paso	31	47	106	30	3,796	69	62	2	6s	
Erie	42	7	80	5	714	92	82	0	20s	
Eureka	40	48	124	11	64	60	52	3	17s	
Fort Smith	35	22	94	24	470	54	48	1	17s	Moved January 1, 1890, to 492 feet.
Fresno	36	43	119	49	328	67	55	2	59s	Moved February 1, 1889, from 313 feet.
Galveston	29	18	94	50	42	94	88	1	19s	

Grand Haven	*43*	*5*	*86*	*13*	*621*	*55*	*47*	*0*	*45s*	*Office burned October 1, 1889; reopened October 9, 1889; old elevation, 620 feet.*
Grant	32	39	109	57	4,916	15	4	2	20s	Moved January 4, 1889, from 4,918 feet.
Green Bay	44	31	88	0	616	49	42	1	0s	
Green Mountain	44	15	68	15	1,541	12	3	0	27F	Opened July 9, 1889; maintained during summer only.
Harrisburg	40	16	76	52	361	94	87	0	7s	Moved January 11, 1890, to 377 feet.
Hatteras	35	15	75	40	11	17	2	0	2s	
Helena	46	34	112	4	4,069	64	51	2	28s	
Huron	44	21	98	9	1,307	47	39	1	32s	
Indianapolis	39	46	86	10	766	76	72	0	44s	
Jacksonville	30	20	81	39	43	69	56	0	26s	
Jupiter	26	57	80	7	28	13	1	0	20s	
Kansas City	39	5	94	37	947	86	77	1	18s	Moved May 1, 1890, to 963 feet.
Keeler	36	35	117	50	3,622	20	20	2	51s	
Keokuk	40	22	91	26	613	63	56	1	6s	Moved September 29, 1889, from 618 feet.
Key West	24	34	81	49	22	41	46	0	27s	
Knoxville	35	56	83	58	980	80	71	0	36s	
La Crosse	43	49	91	15	744	79	71	1	5s	Moved May 2, 1890, to 736 feet.
Lansing	42	44	84	32	883	44	42	0	38s	
Leavenworth	39	19	94	57	842	56	50	1	20s	
Lexington	38	2	84	33	1,040	75	67	0	38s	
Little Rock	34	45	92	6	309	75	54	1	8s	
Los Angeles	34	3	118	15	330	74	66	2	53s	
Louisville	38	15	85	45	551	100	103	0	43s	
Lynchburgh	37	25	79	9	658	67	57	0	16s	Moved April 1, 1890, to 685 feet.
Maginnis	47	12	109	10	4,320	19	2	2	16s	Closed June 30, 1889, as second order station.
Manchester	42	58	71	28	247	76	68	0	14F	
Manistee	44	13	86	16	615	43	28	0	45s	
Marquette	46	34	87	24	735	68	56	0	49s	Moved August 1, 1889, from 672 feet.
McKinney	43	48	106	10	5,000	15	36	2	5s	
Memphis	35	9	90	3	348	108	93	1	0s	Moved February 1, 1889, from 320 feet.
Meridian	32	21	88	41	358	53	42	0	55s	Opened August 28, 1889.
Milwaukee	43	2	87	54	697	106	100	0	51s	Moved March 9, 1890, to 699 feet.
Mobile	30	41	88	2	35	87	81	0	52s	
Montgomery	32	23	86	18	217	68	60	0	45s	
Montrose	38	30	107	56	5,795	39	32	2	12s	
Moorhead	46	52	96	44	926	52	41	1	27s	
Mount Killington	43	38	72	49	4,056	6	3	0	9F	Opened July 13, 1889; maintained during summer only.
Mount Washington	44	16	71	18	6,279	6	2	0	15F	Maintained during summer only.

SIGNAL-SERVICE STATIONS, 1889.—LATITUDE, LONGITUDE, ELEVATION OF BAROMETERS, THERMOMETERS, AND RAIN GAUGES, ETC.—Continued.

Stations.	Latitude.		Longitude.		Elevation December 31, 1889.			Local time, *faster* or *slower* than eastern time.		Changes in elevation of barometers from January 1, 1889, to June 30, 1890.
					Barometer above sea.	Thermometer above ground.	Rain gauge above ground.			
	°	′	°	′	*Feet.*	*Feet.*	*Feet.*	*h.*	*m.*	
Nantucket	41	17	70	6	14	43	3	0	20F	
Nashville	36	10	86	47	553	98	85	0	47s	Moved July 1, 1889, from 549 feet.
New Haven	41	18	72	56	107	118	109	0	8F	
New London	41	21	72	5	47	29	58	0	12F	
New Orleans	29	58	90	4	52	87	77	1	0s	
New York City	40	43	74	0	185	183	155	0	4F	
Norfolk	36	51	76	17	69	87	79	0	5s	Moved January 24, 1890, to 43 feet.
Northfield	44	10	72	41	871	16	2	0	9F	Moved January 14, 1890, to 872 feet.
North Platte	41	8	100	45	2,841	45	34	1	43s	
Olympia	47	3	122	53	36	46	41	3	11s	
Omaha	41	16	95	56	1,113	88	82	1	24s	
Oswego	43	29	76	35	335	76	83	0	6s	
Palestine	31	45	95	40	511	42	38	1	22s	
Parkersburgh	39	16	81	36	638	76	67	0	26s	
Pensacola	30	25	87	13	56	79	80	0	49s	
Philadelphia	39	57	75	9	117	168	166	0	0	
Pittsburgh	40	32	80	2	847	130	126	0	20s	
Port Angeles	48	7	123	6	14	20	2	3	14s	
Port Huron	43	0	82	26	639	70	66	0	30s	
Portland, Me	43	39	70	15	99	81	71	0	19F	
Portland, Oregon	45	32	122	43	80	85	77	3	11s	
Pueblo	38	18	104	36	4,753	23	13	1	58s	Moved July 1, 1889, from 4,724 feet.
Raleigh	35	45	78	37	375	70	2	0	14s	Moved April 1, 1890, to 388 feet.
Rapid City	44	4	103	12	3,280	49	44	1	53s	
Red Bluff	40	10	122	15	342	54	44	3	9s	
Rio Grande City	26	23	98	48	230	11	2	1	35s	
Rochester	43	8	77	42	621	129	125	0	11s	Moved May 22, 1890, to 622 feet.

Roseburgh	*43*	*13*	*123*	*20*	*523*	*54*	*47*	*3*	*13s*	
Sacramento	*38*	*35*	*121*	*30*	*64*	*61*	*57*	*3*	*6s*	
St. Louis	38	38	90	12	571	107	99	1	1s	
St. Paul	44	58	93	3	831	114	108	1	12s	
St. Vincent	48	56	97	14	804	16	15	1	29s	
Salt Lake City	40	46	111	54	4,348	90	77	2	27s	
San Antonio	29	27	98	28	781	17	1	1	34s	
San Diego	32	43	117	10	93	73	64	2	49s	
Sandusky	41	25	82	40	629	64	55	0	30s	
San Francisco	37	48	122	26	60	70	69	3	10s	
Santa Fé	35	41	105	57	7,026	35	29	2	4s	
Sault Ste. Marie	46	28	84	22	642	56	48	0	37s	
Savannah	32	5	81	5	87	66	56	0	24s	
Shreveport	32	30	93	40	249	77	76	1	14s	
Sill	34	40	98	23	1,200	10	3	1	33s	
Sioux City	42	29	96	24	1,158	89	78	1	26s	Opened July 1, 1889.
Spokane Falls	47	40	117	25	1,921	41	35	2	49s	Office burned August 11, 1889; moved from 1,909 to 1,923 feet; moved September 6, 1889, to 1,941 feet; moved November 15, 1889.
Springfield, Ill	39	48	89	39	644	80	61	0	58s	
Springfield, Mo	37	12	93	18	1,356	78	74	1	13s	
Stanton	33	30	105	26	6,150	17	2	2	2s	Moved August 1, 1889, from 6,154 feet.
Sully	44	39	100	39	1,600	15	2	1	43s	
Tampa	27	57	82	27	....	....	....	0	30s	Opened March 13, 1890, elevation 37 feet; moved April 5, 1890, to 36 feet.
Titusville	28	34	80	51	44	16	15	0	23s	Moved July 1, 1889, from 12 feet.
Toledo	41	40	83	34	674	122	113	0	34s	
Valentine	42	50	100	32	2,613	41	31	1	42s	
Vicksburg	32	22	90	53	222	60	54	1	3s	
Walla Walla	46	2	118	20	1,018	66	56	2	53s	
Washakie	43	1	108	54	5,580	23	16	2	16s	
Washington City	38	53	77	1	112	59	42	0	8s	Moved March 22, 1889, from 106 feet.
Whipple Barracks (Prescott)	34	33	112	28	5,389	11	3	2	30s	
Wichita	37	41	97	20	1,366	78	71	1	29s	
Wilmington	34	14	77	57	52	60	52	0	12s	
Winnemucca	40	58	117	43	4,340	62	54	2	51s	
Wood's Holl	41	33	70	40	22	51	39	0	17F	
Yankton	42	54	97	28	1,234	35	26	1	30s	Moved January 7, 1890, to 1,232 feet.
Yuma	32	45	114	36	141	16	1	2	38s	

APPENDIX 11.

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES AT STATIONS OF THE SIGNAL SERVICE.

NOTE.—This appendix contains data for the year ending December 31, 1889. Some unimportant is the average of frequent personal observations made throughout the day. The total movement of tained if desired. All observations have been made at 8 a. m. and 8 p. m., seventy-fifth meridian time. References: Large *H* represents the height of the barometer above sea level; *T* and small *h*, the days are those having .01 of an inch or more of precipitation.

ABILENE, TEX.

[Lat., 32° 14′ N.; long., 99° 45′ W.]

Months and year.	Pressure.		Temperature.							Dew point.		Relative humidity.		Precipitation.	
	Mean.	Range.	8 a. m.	8 p. m.	Mean (max. and min.).	Maximum.	Minimum.	Mean. Maximum.	Mean. Minimum.	8 a. m.	8 p. m.	8 a. m.	8 p. m.	Total.	Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	28.26	.75	37.4	45.9	43.3	73	23	52.1	34.5	34	39	87	78	2.74	1.23
Feb ..	28.30	.90	37.8	50.5	45.9	80	14	56.4	35.4	33	41	85	72	2.62	2.14
Mar ..	28.20	.87	46.3	58.9	54.6	83	32	64.6	44.5	42	49	85	71	1.07	.53
Apr ..	28.17	.67	57.3	73.2	66.4	88	42	77.6	55.2	51	57	80	58	.71	.24
May .	28.16	.70	64.6	76.3	71.5	94	42	81.6	61.4	58	56	78	52	2.93	1.02
June .	28.17	.55	69.1	79.6	74.9	94	58	83.9	65.9	64	65	86	62	6.36	1.92
July .	28.18	.37	74.8	85.8	80.2	98	64	88.8	71.6	68	67	80	56	1.80	.56
Aug ..	28.22	.28	71.9	88.1	80.9	100	63	91.6	70.2	64	60	76	39	.21	.21
Sept .	28.21	.76	62.7	74.1	69.8	96	43	78.8	60.7	58	58	85	59	3.03	1.22
Oct ..	28.26	.61	56.5	68.0	65.2	90	42	76.0	54.5	51	50	83	56	1.22	1.12
Nov ..	28.32	.78	40.3	51.0	47.8	74	26	58.0	37.7	34	34	79	55	2.54	1.10
Dec ..	28.29	.70	52.2	62.0	59.6	78	24	69.1	50.1	47	48	84	61	T.	T.
Year .	28.23	0.66	55.9	67.8	63.3	100	14	73.2	53.5	50	52	82	60	25.23	....

ALBANY, N. Y.

[Lat., 42° 39′ N.; long., 73° 45′ W.]

Jan ..	29.92	1.48	27.4	31.8	31.0	62	6	37.6	24.4	23	26	84	80	2.82	.78
Feb ..	30.02	1.48	17.6	22.2	20.4	43	— 5	27.4	13.5	12	16	80	77	1.81	.48
Mar ..	29.82	1.40	33.0	36.7	36.6	65	19	43.9	29.3	27	31	80	81	1.76	.68
Apr ..	29.90	1.21	46.0	50.9	50.0	80	30	60.1	40.0	39	42	78	72	1.25	.32
May .	29.86	.70	58.8	62.7	60.8	92	36	73.0	51.4	51	54	75	73	3.32	2.10
June .	29.92	.89	64.7	68.9	68.4	48	47	77.5	59.4	59	63	83	82	6.43	1.94
July .	29.88	.61	70.0	72.2	72.5	89	54	80.9	64.1	64	65	82	80	4.19	1.14
Aug ..	29.98	.65	65.1	68.9	69.8	88	51	80.3	59.4	60	62	84	79	3.63	1.52
Sept .	29.97	.93	60.2	62.9	64.2	86	.42	72.6	55.7	55	56	84	79	3.68	.88
Oct ..	29.98	.97	43.5	46.5	48.7	71	28	57.9	39.5	38	40	80	79	2.48	.84
Nov ..	29.99	1.29	39.6	41.8	43.2	62	20	50.4	36.0	36	37	86	83	5.00	1.38
Dec ..	30.06	1.39	31.8	35.0	35.0	66	6	42.5	27.6	26	30	81	81	2.14	.60
Year .	29.94	1.08	46.5	50.0	50.0	92	— 5	58.7	41.7	41	44	81	79	39.51	....

APPENDIX 11.

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES AT STATIONS OF THE SIGNAL SERVICE.

data heretofore published have been omitted for lack of space. The mean cloudiness, as given below, wind, in miles, has been replaced by the average hourly velocity, from which the former can be ob- Appropriate headings show the nature of the data contained in the columns immediately underneath. respective heights of thermometers and rain-gauge above ground. † Additional directions. Rainy

ABILENE, TEX.

[H=1,748. T=64. h=53.]

Months and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days— Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunderstorms.	Auroras.
1889.																							
Jan ..	4.3	9.4	40	NW.	SW.	14	1	0	1	6	16	4	13	7	10	10	11	6	0	12	0	1	0
Feb ..	4.7	10.2	40	N.†	S. SW.†	4	10	6	4	10	10	6	3	3	8	10	10	5	1	9	0	0	0
Mar ..	5.4	11.5	46	N.	SW.	11	10	1	1	10	13	3	9	4	8	14	9	6	0	0	0	6	0
Apr ..	3.0	12.1	38	N.	S.	9	8	0	2	32	3	2	4	0	16	10	4	5	0	0	0	2	0
May .	4.2	14.3	38	S.	S.	4	3	3	11	32	3	0	6	0	13	13	5	6	0	0	2	5	0
June .	5.5	10.5	48	N.	S.	6	4	9	16	17	5	1	1	1	7	14	9	14	0	0	2	11	0
July .	4.2	10.4	60	SW.	S.	3	5	4	5	37	8	0	0	0	16	5	10	8	0	0	11	3	0
Aug ..	1.9	9.7	31	SE.	SE.	0	4	5	29	23	1	0	0	0	22	9	0	1	0	0	22	1	0
Sept .	5.0	10.6	40	NW.	S.	13	3	0	6	33	1	1	2	1	8	13	9	8	0	0	2	5	0
Oct ..	2.8	10.4	35	S.	S.	9	2	0	9	31	4	3	4	0	21	5	5	4	0	0	0	1	0
Nov ..	3.1	11.6	47	NE.	NW.	14	2	1	3	14	6	5	15	0	18	6	6	7	0	4	0	2	0
Dec ..	4.1	12.5	42	S.	S.	8	0	0	2	41	8	0	2	1	12	13	6	0	0	2	0	0	0
Year .	4.0	11.1	..	....	S.	95	52	29	89	286	78	25	59	17	159	122	84	70	1	27	39	37	0

ALBANY, N. Y.

[H=85. T=84. h=90.]

Jan ..	7.0	5.7	36	SE.	NW.	7	0	1	5	8	1	13	15	12	1	18	12	10	7	22	0	0	0
Feb ..	6.3	6.7	36	W.	NW.	7	3	0	6	12	3	8	13	4	3	18	7	12	17	26	0	0	0
Mar ..	6.6	6.8	26	NW.	NW.	14	3	0	3	4	1	12	18	7	5	11	15	14	3	16	0	0	0
Apr ..	5.4	8.2	36	W.†	W.†	9	7	3	9	9	2	10	10	1	4	17	9	8	0	3	0	1	0
May .	5.6	7.6	36	SE.	S.	3	6	0	13	18	0	12	10	0	7	14	10	12	0	0	1	1	0
June .	7.0	6.8	38	SE.	S.	7	4	3	8	19	4	5	9	1	2	9	19	15	0	0	0	5	0
July .	5.9	7.5	30	SE.	SE.	6	6	0	16	14	1	7	12	0	2	17	12	16	0	0	0	0	0
Aug ..	3.8	5.4	22	S.	S.	5	5	1	9	16	6	12	6	2	13	12	6	11	0	0	0	3	0
Sept .	6.1	6.7	22	SE.†	NW.†	8	9	0	8	12	3	7	12	1	7	10	13	11	0	0	0	0	0
Oct ..	6.2	7.6	28	NW.	N.	17	7	0	5	9	3	7	14	0	4	14	13	12	0	4	0	1	0
Nov ..	7.2	5.9	24	N.	S.	7	2	0	4	16	5	14	11	1	3	10	17	16	0	8	0	1	0
Dec ..	6.5	8.0	36	NW.	S.	11	2	0	6	19	4	4	14	2	5	9	17	15	4	18	0	0	0
Year .	6.1	6.9	..	....	S.	101	54	8	92	156	33	111	144	31	56	159	150	152	31	97	1	12	0

MONTHLY AND YEARLY METEROLOGICAL SUMMARIES—Continued.

ALPENA, MICH.

[Lat., 45° 5′ N.; Long., 83° 3′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a.m.	Temperature. 8 p.m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a.m.	Dew-point. 8 p.m.	Relative humidity. 8 a.m.	Relative humidity. 8 p.m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan	29.28	1.74	22.6	25.9	24.4	46	4	29.4	19.5	20	23	89	87	3.26	1.01
Feb	29.39	1.24	9.8	15.7	12.7	36	—14	20.1	5.3	6	11	82	83	2.33	0.62
Mar	29.31	.77	28.2	32.6	31.4	56	12	37.7	25.0	22	26	80	76	0.21	0.10
Apr	29.33	1.01	37.8	41.0	40.4	68	21	48.1	32.7	32	33	81	74	1.55	0.84
May	29.28	.57	49.0	49.8	49.6	91	26	58.6	40.5	40	40	74	73	3.81	0.90
June	29.30	.84	54.3	57.7	55.6	84	41	62.9	48.4	50	50	87	77	4.61	1.40
July	29.30	.67	64.1	66.1	64.8	91	46	73.1	56.6	56	57	78	74	2.04	0.80
Aug	29.38	.61	61.0	65.3	63.7	89	42	72.4	55.0	54	56	80	72	2.02	0.84
Sept	29.32	.92	55.0	58.3	57.2	84	32	65.4	49.1	51	52	86	80	2.84	0.71
Oct	29.46	1.05	38.0	41.9	40.5	62	20	46.9	34.1	32	33	82	73	1.70	1.00
Nov	29.36	1.18	32.6	35.8	34.9	58	14	39.9	29.9	29	30	89	84	4.05	1.10
Dec	29.36	1.20	30.5	32.1	31.3	52	10	37.9	25.6	28	29	89	88	2.90	1.06
Year	29.34	0.98	40.2	43.5	42.2	91	—14	49.3	35.1	35	37	83	78	31.32	.....

FORT ASSINNIBOINE, MONT.

[Lat., 48° 32′ N.; Long., 109° 42′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a.m.	Temperature. 8 p.m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a.m.	Dew-point. 8 p.m.	Relative humidity. 8 a.m.	Relative humidity. 8 p.m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan	27.18	.77	11.5	17.5	14.8	51	—21	24.4	5.1	5	8	74	68	.26	.14
Feb	27.25	.92	16.1	25.1	21.8	62	—22	31.6	12.1	9	15	74	67	.45	.28
Mar	27.18	.87	28.0	45.8	38.3	70	5	50.3	26.3	20	25	73	48	.81	.32
Apr	27.14	.91	38.1	60.7	50.4	81	23	64.3	36.4	26	21	62	23	.31	.29
May	27.10	.90	43.0	60.3	52.0	87	29	63.5	40.6	34	31	73	40	3.15	1.07
June	27.12	.64	52.4	72.8	62.6	98	39	76.3	48.9	40	33	64	27	.24	.11
July	27.18	.56	55.1	74.7	64.9	91	41	77.2	52.6	45	44	72	36	3.22	1.43
Aug	27.12	69	52.9	78.0	66.2	99	41	82.5	50.0	38	40	60	27	.10	.10
Sept	27.16	.72	42.7	62.1	53.1	87	22	66.6	39.6	31	30	67	33	.57	.33
Oct	27.20	.68	36.8	53.7	49.0	89	21	64.3	33.8	27	29	69	44	T	T
Nov	27.22	.89	24.3	32.0	29.0	63	—14	40.7	17.4	14	19	68	62	.26	.14
Dec	27.02	.80	17.1	18.6	18.4	50	—16	27.0	9.8	10	12	77	78	.38	.18
Year	27.16	0.78	34.8	50.1	43.4	99	—22	55.7	31.0	25	26	69	46	9.75	.....

ATLANTA, GA.

[Lat., 33° 45′ N.; Long., 84° 33′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a.m.	Temperature. 8 p.m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a.m.	Dew-point. 8 p.m.	Relative humidity. 8 a.m.	Relative humidity. 8 p.m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan	28.88	.89	38.9	45.7	43.8	66	18	51.0	36.7	32	32	78	63	6.39	1.39
Feb	28.98	.85	35.6	43.7	41.5	75	14	49.9	33.1	31	28	84	57	5.28	1.67
Mar	28.78	.86	44.6	55.3	52.0	78	28	61.4	42.7	39	35	82	49	2.49	1.29
Apr	28.82	.61	55.8	65.8	62.4	85	34	72.9	51.8	47	42	74	46	2.54	1.26
May	28.85	.55	62.2	70.9	68.2	90	41	79.4	57.0	51	48	68	47	3.16	2.36
June	28.90	.42	68.1	74.6	73.2	90	39	82.3	64.1	61	62	78	68	5.03	1.43
July	28.86	.35	73.8	79.0	78.5	95	64	87.0	70.0	69	70	86	74	8.83	2.45
Aug	28.94	.28	69.4	73.9	74.2	89	60	82.1	66.3	65	66	86	77	6.73	1.80
Sept	28.88	.67	64.1	71.1	70.0	92	45	79.0	60.9	60	60	86	69	6.32	3.43
Oct	28.90	.53	52.8	62.1	60.2	81	37	70.3	50.1	47	46	81	58	2.21	1.33
Nov	28.92	.88	46.2	52.2	51.6	72	23	59.2	44.1	41	46	82	69	5.17	1.21
Dec	29.05	.46	50.7	58.3	57.2	72	29	65.5	48.8	46	47	85	69	.60	.41
Year	28.90	0.61	55.2	62.7	61.1	95	14	70.0	52.1	49	48	81	62	54.75	.....

MONTHLY AND YEARLY METEROLOGICAL SUMMARIES—Continued.

ALPENA, MICH.

[H=609. T=63. h=54.]

Month and year.	Mean cloudiness (in tenths).	Wind.													Number of days.								
		Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	7.8	9.3	32	NW.†	W.	6	4	2	7	7	9	21	5	1	2	7	22	19	19	30	0	0	0
Feb ..	7.0	10.8	33	NE.	W.	2	3	4	4	5	8	16	14	0	2	10	16	17	24	28	0	0	0
Mar ..	5.9	10.0	36	W.	NW.	6	2	7	8	1	3	14	17	4	5	11	15	6	3	28	0	0	1
Apr ..	6.2	10.2	32	W.†	NW.†	6	4	2	15	3	4	9	15	2	8	5	17	12	1	11	0	1	0
May .	6.0	10.1	32	NW.	NW.†	3	11	6	15	4	2	5	15	1	7	6	18	12	0	3	1	4	0
June .	6.8	7.9	36	W.	SE.	2	5	3	18	2	6	10	11	3	7	7	16	20	0	0	0	2	0
July .	4.9	8.0	24	SE.	SE.	5	1	6	18	4	7	12	9	0	9	13	9	13	0	0	2	7	1
Aug .	5.0	7.7	28	E.	W.	2	1	7	12	6	7	14	12	1	10	10	11	9	0	0	0	1	0
Sept..	6.3	8.4	30	NW.	SE.	2	1	5	14	10	10	11	5	2	7	8	15	14	0	0	0	2	0
Oct ..	7.0	8.5	33	NW.	NW.	6	8	2	6	4	4	12	20	0	3	13	15	10	0	13	0	0	0
Nov ..	7.3	9.7	40	NE.	W.	5	8	6	1	0	13	14	12	1	6	5	19	16	4	16	0	0	0
Dec ..	7.3	10.3	42	W.	W.	2	3	9	6	10	6	21	5	0	3	11	17	19	6	23	0	0	0
Year .	6.5	9.2	..	......	W.	47	51	59	124	56	79	159	140	15	69	106	190	167	57	152	3	17	2

FORT ASSINNIBOINE, MONT.

[H=2,690. T=16. h=2.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	3.8	11.6	60	SW.	SW.	0	1	4	4	2	36	11	3	1	13	5	13	5	20	30	0	0	0
Feb ..	5.4	11.5	72	NW.	SW.	1	5	3	0	2	27	11	5	2	8	5	15	8	11	26	0	0	0
Mar ..	5.6	9.9	48	SW.	SW.	3	5	14	3	4	17	7	9	0	9	5	17	7	4	22	0	0	3
Apr ..	5.8	11.6	60	W.	SW.	3	3	9	1	11	13	12	8	0	4	9	17	2	0	3	0	0	0
May .	5.4	12.1	50	W.	NW.	2	6	14	6	3	8	7	15	1	7	12	12	12	0	1	0	0	0
June .	4.8	11.0	60	SW.	W.	4	4	8	7	4	11	12	9	1	10	8	12	5	0	0	2	1	0
July .	6.2	9.2	40	SW.	SW.	4	9	11	5	6	13	4	10	0	4	11	16	8	0	0	2	2	0
Aug ..	1.4	8.5	53	SW.	SW.	1	4	10	4	13	15	8	7	0	25	4	2	1	0	0	3	0	0
Sept .	5.9	12.4	56	SW.	SW.	1	3	2	2	4	21	15	12	0	7	9	14	4	0	4	0	0	0
Oct ..	4.0	9.9	57	W.	SW.	1	2	14	2	12	20	9	1	1	12	14	5	0	0	13	0	0	0
Nov ..	4.0	12.0	48	SW.	SW.	3	10	0	1	4	27	10	2	0	16	5	8	5	9	26	0	0	0
Dec ..	4.5	12.0	40	W.	SW.	0	12	4	2	3	29	6	4	2	11	15	5	6	16	30	0	0	2
Year .	4.7	11.0	..	......	SW.	23	64	93	37	68	237	112	85	8	126	102	136	63	60	155	7	3	5

ATLANTA, GA.

[H=1,139. T=98. h=94.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	5.4	10.8	44	W.	W.	2	4	14	8	2	1	16	14	1	10	9	12	14	1	7	0	0	0
Feb ..	5.2	10.9	36	NW.	NW.	0	0	12	7	1	7	9	20	0	9	10	9	8	0	13	0	1	0
Mar ..	3.7	10.3	32	NW.	NW.	4	1	7	6	5	4	8	27	0	18	7	6	4	0	2	0	1	0
Apr ..	3.2	9.2	37	SE.	NW.	6	1	7	4	3	6	6	27	0	15	10	5	5	0	0	0	1	0
May .	2.4	8.9	29	SE.	NW.	6	2	5	5	0	2	11	30	1	14	15	2	7	0	0	0	3	0
June .	5.6	6.4	34	W.	NW.	1	4	12	12	9	3	6	13	0	7	17	6	13	0	0	0	6	0
July .	6.5	6.2	22	NW.	NW.	3	3	10	8	4	5	14	15	0	7	10	14	16	0	0	5	8	0
Aug ..	6.3	5.5	27	W.	E.	6	9	15	12	2	5	4	8	1	7	13	11	15	0	0	0	11	0
Sept .	4.5	8.0	30	E.	NW.	5	3	14	12	1	0	2	23	0	11	15	4	9	0	0	1	0	0
Oct ..	3.4	8.1	30	E.	NW.	13	3	6	5	1	2	7	25	0	18	9	4	4	0	0	0	2	0
Nov ..	6.5	10.2	36	E.	NW.	6	4	5	10	6	1	11	17	0	6	11	13	13	0	2	0	1	0
Dec ..	4.6	7.5	26	SE.	W.	4	2	6	5	5	11	16	13	0	13	11	7	3	0	2	0	0	0
Year .	4.8	8.5	..	......	NW.	56	36	113	94	39	47	110	232	3	135	137	93	111	1	26	6	34	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

ATLANTIC CITY, N. J.

[Lat., 39° 22′ N.; Long., 74° 25′ W.]

Month and year.	Pressure.		Temperature.							Dew point.		Relative humidity.		Precipitation.	
	Mean.	Range.	8 a. m.	8 p. m.	Mean (max. and min.).	Maximum.	Minimum.	Mean. Maximum.	Mean. Minimum.	8 a. m.	8 p. m.	8 a. m.	8 p. m.	Total.	Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	30.01	1.43	35.4	38.9	37.6	52	19	44.1	31.1	31	34	85	84	4.46	1.06
Feb ..	30.12	1.37	27.9	31.2	29.5	48	2	36.5	22.5	20	25	73	78	2.32	.96
Mar ..	29.86	1.24	38.1	40.2	38.8	60	27	44.5	33.2	32	33	80	76	4.58	1.82
Apr ..	29.92	1.21	47.6	49.4	48.6	70	32	54.7	42.4	41	44	79	82	2.92	.94
May .	29.94	.73	57.6	58.5	59.0	89	41	65.5	52.5	52	55	81	88	2.62	.72
June .	30.00	.76	65.6	65.4	66.2	88	50	71.2	61.2	61	62	86	89	3.13	1.30
July .	29.95	.58	70.7	71.5	71.8	88	56	76.5	67.0	66	67	86	87	4.66	1.33
Aug ..	30.03	.49	68.4	68.2	69.3	84	57	74.8	63.8	63	64	84	86	1.93	1.39
Sept .	29.97	.76	63.9	65.0	64.4	82	45	69.7	59.0	60	60	87	85	3.17	1.02
Oct ..	29.98	.79	50.5	53.2	51.8	71	37	57.5	46.1	45	47	82	81	3.02	.90
Nov ..	30.04	1.27	45.2	47.8	47.0	64	25	52.6	41.5	41	42	84	81	5.77	2.94
Dec ..	30.14	1.21	40.6	44.5	43.6	68	22	50.5	36.7	36	38	84	78	.25	.08
Year .	30.00	0.99	51.0	52.8	52.3	89	2	58.2	46.4	46	48	83	83	38.83	.....

AUGUSTA, GA.

[Lat., 33° 28′ N.; Long., 81° 54′ W.]

Jan ..	29.92	.92	41.4	48.8	47.6	70	24	56.3	39.0	37	41	85	74	6.92	1.98
Feb ..	30.04	.99	39.3	46.9	45.6	78	20	55.0	36.3	32	35	78	65	5.78	2.37
Mar ..	29.80	1.02	47.7	56.6	54.8	80	31	65.0	44.6	42	44	82	66	2.72	1.28
Apr ..	29.83	.72	58.5	66.1	64.6	87	37	77.0	52.3	51	52	76	63	2.71	1.56
May .	29.84	.59	67.5	74.4	72.6	99	45	86.5	58.8	58	58	71	58	1.02	0.81
June .	29.90	.46	73.6	77.3	78.1	98	46	88.9	67.3	67	67	81	71	4.02	1.87
July .	29.86	.38	77.5	80.6	82.0	100	66	91.3	72.8	72	72	85	77	10.10	3.93
Aug ..	29.94	.32	73.0	75.9	77.8	95	61	86.6	68.9	70	70	88	82	8.68	3.32
Sept .	29.88	.60	68.4	73.8	74.6	94	48	84.9	64.2	64	66	85	78	2.43	1.90
Oct ..	29.92	.61	54.0	61.9	62.8	88	36	76.1	49.5	49	53	85	73	1.59	1.34
Nov ..	29.96	.90	50.4	55.1	56.0	79	24	65.5	46.5	46	48	86	76	2.73	1.26
Dec ..	30.09	.58	47.2	57.0	57.4	78	26	69.7	45.2	45	50	92	79	0.55	0.54
Year .	29.92	0.67	58.2	64.5	64.5	100	20	75.2	53.8	53	55	83	72	49.25	.....

BAKER CITY, OREGON.

[Lat., 44° 50′ N.; Long., 117° 50′ W.]

Jan ..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Feb ..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mar ..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Apr ..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
May .	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
June .	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
July*	26.44	.42	59.3	83.9	71.5	95	51	88.0	55.0	40	42	51	24	T.†	T.†
Aug ..	26.45	.54	52.4	78.4	66.0	95	37	83.5	48.6	38	45	59	33	T.	T.
Sept .	26.54	.66	42.1	67.0	54.8	83	27	70.9	38.6	25	33	52	31	0.19	0.15
Oct ..	26.48	.79	41.8	56.9	51.1	85	29	62.3	39.6	32	38	71	55	1.46	0.38
Nov ..	26.59	.90	28.5	38.9	36.2	56	10	45.2	27.1	22	27	77	64	1.08	0.46
Dec ..	26.36	.74	20.2	27.9	26.1	49	2	33.8	18.4	15	20	80	72	1.44	0.46
Year .	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* All data for July, except precipitation, are for 22 days only. † Data for 31 days.

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

ATLANTIC CITY, N. J.

[H=53. T=68. h=57.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	3.5	10.7	48	NE.	W.	6	7	1	3	7	9	18	11	0	12	12	7	6	0	19	0	0	0
Feb ..	4.6	10.7	32	W.	W.	8	5	4	3	4	3	17	12	0	6	14	8	7	7	24	0	0	0
Mar ..	4.6	13.3	36	NE.	NE.	9	13	0	3	5	8	10	10	4	11	7	13	11	0	10	0	0	0
Apr ..	5.8	14.6	53	NE.	SW.	7	10	6	3	8	15	3	7	1	9	9	12	14	0	0	0	2	0
May .	4.2	10.6	50	NW.	NW.	4	5	10	9	9	11	3	11	0	12	10	9	13	0	0	0	1	0
June .	6.6	11.2	46	SE.	SW.	1	7	6	4	6	24	5	7	0	1	21	8	10	0	0	0	2	0
July .	5.6	10.6	31	NW.	S.	6	2	2	6	20	12	7	7	0	11	6	14	15	0	0	0	0	0
Aug ..	4.5	10.7	31	NE.	SW.	4	14	4	0	7	20	5	8	0	12	11	8	7	0	0	0	1	0
Sept .	5.7	14.4	72	NE.	NE.	1	11	7	4	9	8	9	9	2	7	13	10	11	0	0	0	0	0
Oct ..	5.6	13.3	48	NE.	N.	15	9	1	3	7	11	4	10	2	12	5	14	14	0	0	0	0	0
Nov ..	5.6	11.7	35	SE.	W.	8	0	6	7	4	8	16	11	0	8	9	13	13	0	5	0	0	0
Dec ..	4.7	11.8	48	W.	SW.	9	1	4	2	7	17	8	14	0	12	9	10	7	1	7	0	0	0
Year .	5.1	12.0	..	......	SW.	78	84	51	47	93	146	105	117	9	113	126	126	128	8	65	0	6	0

AUGUSTA, GA.

[H=183. T=45. h=40.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	6.2	4.4	28	W.	W.	5	7	5	2	5	5	21	7	5	8	9	14	10	0	7	0	0	0
Feb ..	5.6	5.1	25	NE.	W.	7	5	4	1	6	5	19	6	3	8	10	10	9	0	6	0	3	0
Mar ..	4.6	4.7	30	N.	W.	10	5	6	5	4	7	18	6	1	14	9	8	7	0	1	0	1	0
Apr ..	2.9	4.7	31	N.	W.	7	6	2	9	6	6	11	7	6	17	8	5	5	0	0	0	2	0
May .	2.7	3.9	20	W.	W.	2	1	1	5	8	7	19	15	4	18	9	4	3	0	0	13	0	0
June .	6.4	4.0	26	N.	SE.	3	5	6	17	7	3	7	9	3	5	13	12	10	0	0	16	3	0
July .	6.3	3.5	19	SE.	SE.	4	9	4	15	11	9	5	1	4	9	8	14	13	0	0	18	7	0
Aug ..	7.0	2.9	19	N.	NE.	6	14	3	10	11	2	4	3	9	6	8	17	15	0	0	6	1	0
Sept .	4.1	2.8	17	SW.	SE.	3	6	4	15	3	3	6	7	13	12	11	7	6	0	0	6	0	0
Oct ..	2.6	3.0	27	N.	W.	10	1	3	4	3	2	11	7	21	21	8	2	3	0	0	0	1	0
Nov ..	5.0	4.4	20	S.	W.	0	9	5	6	3	8	14	3	12	13	6	11	7	0	2	0	0	0
Dec ..	3.1	2.5	20	NE.	W.	3	3	3	0	6	11	14	2	20	20	7	4	3	0	3	0	0	0
Year .	4.7	3.8	..	......	W.	60	71	46	89	73	68	149	73	101	151	106	108	91	0	19	59	18	0

BAKER CITY, OREGON.

[H=3,526. T=49. h=38.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	....	.....	..	......	......	..	..	..	..	..	...	...	...	...	...	...	...	...	..	..	..	..	..
Feb ..	....	.....	..	......	......	..	..	..	..	..	...	...	...	...	...	...	...	...	..	..	..	..	..
Mar ..	....	.....	..	......	......	..	..	..	..	..	...	...	...	...	...	...	...	...	..	..	..	..	..
Apr ..	....	.....	..	......	......	..	..	..	..	..	...	...	...	...	...	...	...	...	..	..	..	..	..
May .	....	.....	..	......	......	..	..	..	..	..	...	...	...	...	...	...	...	...	..	..	..	..	..
June .	....	.....	..	......	......	..	..	..	..	..	...	...	...	...	...	...	...	...	..	..	..	..	..
July .	2.1	6.9	24	N.	SE.	5	0	0	21	2	0	0	17	0	15	7	1	0	0	0	8	0	0
Aug ..	1.1	6.5	26	NW.	SE.	2	1	0	26	7	1	1	22	2	24	4	3	0	0	0	5	1	0
Sept .	1.8	7.1	21	NW.	SE.	5	1	1	27	1	5	0	19	1	24	2	4	4	0	5	0	0	0
Oct ..	6.3	6.4	26	S.	SE.	1	2	1	28	20	2	0	4	4	7	10	14	17	0	1	0	0	0
Nov ..	5.7	5.8	24	NW.	SE.	3	1	1	34	4	3	1	8	5	7	12	11	10	0	25	0	0	0
Dec ..	6.4	6.3	30	SE.	SE.	0	0	0	44	4	1	0	5	8	6	10	15	14	14	27	0	0	0
Year .	....	.....	..	......	......	..	..	..	..	..	...	...	...	...	...	...	...	...	..	..	..	..	..

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

BALTIMORE, MD.

[Lat., 39° 18′ N.; Long., 76° 37′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	29.98	1.38	35.6	39.6	38.9	60	20	44.8	33.0	28	29	74	67	4.22	1.20
Feb ..	30.10	1.31	27.0	31.8	30.8	48	3	36.8	24.8	17	19	69	60	2.53	1.18
Mar ..	29.86	1.10	40.0	45.7	43.4	68	28	50.7	36.0	29	31	66	59	5.71	2.71
Apr ..	29.89	1.17	51.3	56.7	54.6	80	34	62.7	46.6	40	42	67	63	8.70	3.58
May .	29.90	.65	63.1	66.8	65.8	93	43	75.0	56.7	52	55	68	68	6.82	2.20
June .	29.96	.76	69.1	72.3	71.5	91	52	79.0	64.0	60	62	73	72	6.17	1.32
July .	29.90	.56	74.6	76.8	76.6	93	61	83.7	69.6	66	67	75	74	11.03	4.02
Aug ..	30.00	.52	70.2	74.6	73.8	90	58	82.1	65.6	61	64	73	71	1.40	.45
Sept .	29.96	.76	64.2	66.1	66.5	84	46	73.5	59.5	57	59	78	77	4.59	.86
Oct ..	29.96	.84	50.5	54.5	53.8	82	34	60.9	46.6	41	42	72	65	4.12	1.24
Nov ..	30.01	1.19	45.0	47.8	47.7	70	28	53.9	41.5	38	39	77	73	6.45	1.64
Dec ..	30.10	1.19	41.0	46.5	46.0	73	23	54.1	37.9	32	35	73	67	.61	.23
Year .	29.97	0.94	52.6	56.6	55.8	93	3	63.1	48.5	43	45	72	68	62.35	....

BISMARCK, N. DAK.

[Lat., 46° 47′ N.; Long., 100° 38′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	28.22	1.06	10.0	17.5	14.7	46	—18	24.8	4.6	8	13	90	82	0.50	0.18
Feb ..	28.29	1.29	5.5	13.1	10.7	48	—34	20.5	0.9	3	9	91	85	1.48	0.74
Mar ..	28.27	.77	25.9	40.7	36.2	69	4	48.4	23.9	22	22	87	53	0.55	0.42
Apr ..	28.22	.97	38.9	56.7	48.9	85	20	62.6	35.2	30	28	73	36	0.26	0.11
May .	28.14	1.39	45.5	59.3	52.4	81	22	63.9	41.0	39	42	80	61	3.35	1.35
June .	28.16	.66	56.9	74.4	65.0	97	42	77.9	52.0	52	58	85	58	1.03	0.42
July .	28.16	.59	61.7	75.8	68.7	95	48	80.1	57.4	58	62	88	64	2.01	0.69
Aug ..	28.16	.71	59.9	80.0	70.3	102	44	84.8	55.8	55	62	86	54	0.53	0.31
Sept .	28.15	.86	46.5	60.1	55.8	93	26	68.8	42.9	43	50	88	71	0.48	0.16
Oct ..	28.30	.81	36.7	51.6	47.4	86	23	60.6	34.1	33	42	88	72	T	T
Nov ..	28.28	1.04	18.5	30.2	26.4	63	—12	38.4	14.3	15	25	87	81	0.15	0.15
Dec ..	28.15	.95	13.3	18.3	16.0	42	— 6	26.1	6.0	9	13	83	80	0.69	0.65
Year .	28.21	0.92	34.9	48.1	42.7	102	—34	54.7	30.7	31	36	86	66	11.03	....

BLOCK ISLAND, R. I.

[Lat., 41° 10′ N.; Long., 71° 36′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.99	1.49	35.6	37.5	36.1	56	10	40.9	31.3	29	32	79	82	2.16	.54
Feb ..	30.08	1.46	26.7	28.8	27.0	48	2	32.3	21.7	20	24	78	84	1.57	.35
Mar ..	29.84	1.42	36.1	37.7	37.2	49	24	41.6	32.8	30	32	80	82	2.30	.72
Apr ..	29.96	1.21	43.5	45.1	44.1	58	32	48.8	39.4	39	40	85	86	2.10	.90
May .	29.96	.74	53.3	54.2	53.8	70	40	59.4	48.1	49	51	87	90	3.21	.98
June .	30.02	.89	62.7	62.4	62.9	76	52	67.9	57.9	59	60	90	91	2.84	1.00
July .	29.98	.61	67.1	67.3	67.6	81	57	72.6	62.7	64	64	89	91	2.92	1.32
Aug ..	30.05	.59	67.1	67.1	67.2	80	56	71.5	63.0	63	63	88	88	3.37	1.09
Sept .	30.02	.89	63.2	63.3	63.0	74	49	67.0	58.9	60	60	89	90	3.41	.69
Oct ..	30.00	.81	51.6	52.2	51.2	66	36	56.0	46.5	47	47	84	84	3.11	1.00
Nov ..	30.04	1.30	46.5	47.3	46.6	62	25	51.4	41.9	40	41	78	81	4.86	1.62
Dec ..	30.12	1.53	41.3	42.4	41.4	57	18	47.5	35.2	35	35	80	78	.95	.26
Year .	30.00	1.08	49.6	50.4	49.8	81	2	54.7	45.0	45	46	84	86	32.80	....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

BALTIMORE, MD.

[H=76. T=86. h=78.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
1889.																							
Jan ..	4.2	5.3	24	NW.	NW.	6	13	1	1	4	5	12	13	7	11	8	12	12	0	13	0	0	0
Feb ..	5.8	5.7	24	NW.	NW.	7	7	2	6	4	6	8	16	0	8	8	12	11	6	22	0	0	0
Mar ..	6.0	7.2	25	NE.	NW.	7	9	4	6	6	8	6	16	0	7	14	10	13	0	4	0	0	0
Apr ..	5.9	7.6	35	NE.	NE.	8	16	2	4	5	6	7	9	3	4	17	9	16	0	0	0	2	0
May .	5.3	5.6	35	NW.	NW.	6	6	8	10	9	2	9	10	2	8	15	8	16	0	0	1	3	0
June .	6.6	5.4	26	S.	SW.	2	10	4	5	9	15	4	10	1	4	14	12	14	0	0	1	5	0
July .	6.1	5.3	24	N.	NW.	7	5	3	9	11	11	5	11	0	7	10	14	18	0	0	3	3	0
Aug ..	4.3	5.3	18	NE.	SW.	7	19	0	1	4	20	3	8	0	12	13	6	9	0	0	0	1	0
Sept .	6.0	7.1	30	N.	NE.	2	18	2	4	6	10	6	12	0	9	8	13	17	0	0	0	0	0
Oct ..	5.9	6.3	24	N.	NE.	7	20	3	3	3	11	2	12	1	9	9	13	12	0	0	0	0	0
Nov ..	6.4	5.3	22	NE.	NW.	7	11	4	2	7	7	6	16	0	7	8	15	16	0	4	0	0	0
Dec ..	4.9	5.0	24	W.	SW.	3	13	4	6	5	13	5	11	2	14	6	11	10	0	6	0	0	0
Year .	5.6	5.9	...	......	NE.	69	147	37	57	73	114	73	144	16	100	130	135	164	6	49	5	14	0

BISMARCK, N. DAK.

[H=1,681. T=16. h=2.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	4.2	9.6	48	NW.	NW.	5	3	6	2	5	7	8	21	5	7	15	9	12	19	31	0	0	0
Feb ..	5.6	10.9	56	N.	NW.	6	3	5	5	3	4	6	19	5	5	15	8	8	19	27	0	1	0
Mar ..	3.8	9.3	48	NW.	NW.	7	2	10	3	9	5	3	18	5	9	15	7	5	3	24	0	0	3
Apr ..	4.0	11.5	70	W.	NW.	4	9	3	6	5	3	2	18	10	8	16	6	4	0	8	0	0	0
May .	5.0	10.3	42	S.	NE.	5	16	4	3	8	1	12	9	4	10	11	10	11	0	3	0	1	0
June .	4.4	9.7	46	S.	S.	9	5	2	7	15	1	5	15	1	14	11	5	11	0	0	3	0	0
July .	4.9	10.2	36	S.	NW.	10	9	9	5	7	1	4	17	0	13	10	8	13	0	0	1	2	0
Aug ..	4.8	10.4	41	NW.	NW.	2	5	6	10	10	2	2	23	2	12	13	6	4	0	0	5	0	0
Sept .	5.2	13.1	46	N.	NW.	7	5	4	3	5	6	13	17	0	13	6	11	6	0	2	1	0	0
Oct ..	4.5	10.1	36	NW.	NW.	6	3	7	16	7	2	0	17	4	17	6	8	0	0	15	0	0	0
Nov ..	4.6	8.7	48	NW.	NW.	7	2	1	7	3	7	5	27	1	17	5	8	1	11	29	0	0	0
Dec ..	4.7	7.7	40	NW.	NW.	11	10	5	6	4	0	2	24	0	17	6	8	2	20	31	0	0	0
Year .	4.6	10.1	...	......	NW.	79	72	62	73	81	39	62	225	37	142	129	94	77	72	170	10	4	3

BLOCK ISLAND, R. I.

[H=26. T=39. h=33.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	4.4	18.6	70	E.	NW.	3	9	5	2	1	7	12	20	3	12	8	11	11	3	13	0	0	0
Feb ..	4.6	18.6	44	NW.	NW.	6	8	3	3	3	3	9	20	1	8	11	9	10	11	26	0	0	0
Mar ..	5.6	23.4	72	NE.	NE.	1	20	4	2	3	8	6	16	2	11	5	15	13	0	10	0	0	0
Apr ..	5.0	17.4	52	NE.	NE.	2	13	8	3	3	11	7	11	2	9	9	12	12	0	0	0	1	0
May .	3.6	13.2	50	NE.	W.	1	6	5	7	8	12	13	9	1	9	9	13	10	0	0	0	2	0
June .	4.5	14.5	36	E.	SW.	0	2	3	3	5	25	12	7	3	6	10	14	7	0	0	0	0	0
July .	6.7	12.3	52	NE.	SW.	3	5	8	5	2	25	4	8	2	7	10	14	12	0	0	0	0	0
Aug ..	5.3	14.0	48	NE.	SW.	3	10	8	2	1	17	10	8	3	10	12	9	11	0	0	0	2	0
Sept .	5.4	19.9	66	NE.	SW.	2	11	7	5	1	14	8	11	1	12	7	11	14	0	0	0	0	0
Oct ..	6.1	21.0	78	NE.	NE.	3	25	2	3	3	8	4	12	2	9	7	15	17	0	0	0	0	0
Nov ..	5.8	16.2	60	E.	NW.	3	3	5	7	1	6	11	20	4	10	8	12	16	0	3	0	0	0
Dec ..	5.6	19.3	60	NE.	NW	2	8	2	5	1	8	15	21	0	7	15	9	12	1	10	0	0	0
Year .	5.2	17.4	...	......	NW.	29	120	60	47	32	144	111	163	24	110	111	144	145	15	62	0	5	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

BOISÉ CITY, IDAHO.

[Lat., 43° 37′ N.; Long., 116° 12′ W.]

Month and year.	Pressure.		Temperature.							Dew-point.		Relative humidity.		Precipitation.	
								Mean.							
	Mean.	Range.	8 a. m.	8 p. m.	Mean (max. and min.)	Maximum.	Minimum.	Maximum.	Minimum.	8 a. m.	8 p. m.	8 a. m.	8 p. m.	Total.	Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	27.34	.90	16.2	27.2	23.9	47	2	35.3	12.5	12	17	84	68	.44	.23
Feb ..	27.33	.96	25.1	39.0	34.8	64	10	46.9	22.6	21	24	84	58	.04	.03
Mar ..	27.16	.97	41.7	58.8	50.2	74	30	61.9	38.5	31	31	68	39	1.03	.55
Apr ..	27.14	.75	43.6	65.6	55.0	84	30	68.4	41.7	34	28	69	29	1.72	.77
May .	27.09	.77	50.1	67.9	58.9	92	34	71.0	46.8	40	38	69	38	2.76	.64
June .	27.10	.54	56.0	82.4	68.9	98	45	84.9	52.9	38	30	52	18	.19	.19
July .	27.10	.66	58.5	89.6	73.8	102	44	91.8	55.8	36	33	44	14	T	T
Aug ..	27.09	.57	57.3	86.4	72.4	101	44	90.0	54.8	36	39	47	19	.41	.29
Sept ..	27.22	.75	45.8	71.8	58.8	88	28	74.7	43.0	26	26	48	20	.06	.05
Oct ..	27.19	.83	47.5	62.6	55.8	91	30	67.5	44.2	36	34	66	39	1.40	.43
Nov ..	27.34	.81	33.0	43.1	40.2	59	23	51.1	29.4	26	27	77	56	.86	.25
Dec ..	27.12	.78	32.0	36.0	34.1	53	12	39.6	28.6	26	26	80	70	2.04	.41
Year .	27.18	.77	42.2	60.9	52.2	102	2	65.3	39.2	30	29	66	39	10.95	....

BOSTON, MASS.

[Lat., 42° 21′ N.; Long., 71° 4′ W.]

Jan ..	29.86	1.50	33.2	36.7	35.8	60	9	42.0	29.5	24	28	70	73	4.11	2.15
Feb ..	29.94	1.56	23.9	27.0	26.0	50	— 1	33.0	19.0	16	19	71	73	1.54	.42
Mar ..	29.74	1.53	35.8	39.0	38.2	64	22	44.3	32.1	25	29	66	69	1.19	.36
Apr ..	29.85	1.07	47.0	48.4	47.8	81	32	54.9	40.8	38	39	72	73	3.07	1.02
May .	29.83	.73	59.2	61.8	60.3	91	41	69.5	51.1	51	53	76	73	4.15	2.24
June .	29.88	.91	67.1	68.3	69.2	87	50	77.0	61.3	61	61	80	79	2.77	1.23
July .	29.86	.62	68.5	68.9	69.4	86	55	76.0	62.8	62	63	81	83	5.80	1.81
Aug ..	29.94	.61	65.5	67.3	67.4	84	52	73.8	60.9	58	60	78	79	3.95	1.50
Sept .	29.93	.93	60.5	62.5	62.8	83	43	69.0	56.7	56	56	85	82	3.19	.84
Oct ..	29.90	.88	46.7	49.2	48.5	74	32	54.5	42.5	39	40	75	73	3.31	1.12
Nov ..	29.92	1.34	42.9	41.4	44.6	66	21	50.4	38.9	36	35	78	71	4.91	1.70
Dec ..	29.99	1.68	35.9	38.5	38.0	65	10	45.1	30.8	27	27	72	66	1.83	.42
Year .	29.89	1.11	48.8	50.1	50.7	91	— 1	57.5	43.9	41	42	75	74	39.82	....

BROWNSVILLE, TEX.

[Lat., 25° 53′ N.; Long., 97° 26′ W.]

Jan ..	30.04	.73	53.9	59.6	59.2	77	37	66.9	51.5	51	53	90	81	2.72	1.21
Feb ..	30.08	.72	59.3	62.7	62.7	88	45	68.4	57.0	57	59	91	88	3.27	1.15
Mar ..	29.97	.55	60.2	65.8	65.6	85	47	72.8	58.5	57	60	91	82	3.61	1.40
Apr ..	29.93	.55	70.2	73.5	74.4	92	56	81.5	67.2	67	67	88	80	2.69	2.66
May .	29.94	.45	73.2	76.6	76.4	87	59	82.6	70.2	70	70	89	78	1.26	.96
June .	29.89	.34	79.6	81.6	82.0	91	68	88.5	75.6	76	75	88	81	4.43	1.90
July .	29.92	.31	81.0	84.1	84.2	94	74	91.0	77.5	77	76	88	76	.50	.40
Aug ..	29.93	.19	78.1	82.6	82.5	93	72	89.7	75.3	76	75	92	79	7.03	1.93
Sept .	29.90	.48	73.5	77.1	77.3	90	56	84.0	70.6	71	72	92	85	7.44	5.15
Oct ..	30.01	.46	68.9	75.0	75.6	89	49	84.6	66.5	66	68	90	80	.20	.20
Nov ..	30.07	.73	58.4	64.4	64.6	85	38	74.3	55.0	55	56	89	75	1.44	.47
Dec ..	30.08	.51	64.8	70.2	71.1	82	50	78.7	63.5	62	65	92	83	.02	.02
Year .	29.98	.50	68.4	72.8	73.0	94	37	80.2	65.7	65	66	90	81	34.61	....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

BOISÉ CITY, IDAHO.

[H=2,750. T=43. h=35.]

Month and year.	Mean cloudiness (in tenths).	Wind.													Number of days.								
		Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	3.4	2.4	22	S.	N.	15	3	7	7	6	0	9	3	12	12	7	12	6	4	31	0	0	0
Feb ..	4.1	2.4	20	NW.	W.	5	2	4	5	6	1	21	3	9	5	16	7	2	0	27	0	0	0
Mar ..	4.7	4.8	33	W.	W.	8	2	5	5	14	2	16	9	1	7	16	8	11	0	5	0	0	0
Apr ..	4.8	4.6	25	NW.†	W.	4	1	7	4	9	1	14	11	9	9	16	5	8	0	1	0	0	0
May .	5.2	5.3	32	W.	W.	4	1	11	6	9	0	14	11	6	6	16	9	12	0	0	1	3	0
June .	3.4	4.4	24	W.	W.	6	2	2	6	9	1	24	6	4	15	11	4	1	0	0	7	1	0
July .	1.5	3.7	20	NW.	W.	7	1	4	5	9	2	18	7	9	26	4	1	0	0	0	18	0	0
Aug ..	1.9	3.5	32	W.	NW.	2	3	8	12	4	1	11	18	3	23	7	1	2	0	0	20	1	0
Sept ..	1.6	3.7	24	NW.	W.	3	2	2	9	8	1	18	14	3	24	4	2	2	0	3	0	0	0
Oct ..	6.1	4.5	24	SE.	SE.	5	5	9	13	9	3	4	10	4	4	15	12	9	0	2	1	0	0
Nov ..	5.5	3.6	25	NW.	SE.	7	7	6	13	8	3	8	4	4	7	13	10	8	0	22	0	0	0
Dec ..	7.9	4.6	24	SE.†	SE.	3	2	7	22	3	2	12	6	4	2	8	21	18	4	22	0	0	0
Year .	4.2	4.0	..	.....	W.	69	31	72	107	94	18	169	102	68	140	133	92	79	8	113	47	5	0

BOSTON, MASS.

[H=125. T=115. h=174.]

Jan ..	4.9	12.8	54	SE.	W.	3	6	0	3	6	12	18	13	1	7	12	12	11	4	14	0	0	0
Feb ..	4.4	12.1	38	SW.	W.	7	3	2	4	2	11	15	12	0	6	13	9	12	11	26	0	0	0
Mar ..	6.2	14.3	46	NE.	W.	7	13	5	4	5	5	14	9	0	7	10	14	9	0	13	0	0	0
Apr ..	5.1	11.7	36	NE.	NW.†	8	10	6	6	5	6	9	10	0	10	12	8	12	0	0	0	2	0
May .	4.7	9.5	36	W.	SW.	2	5	6	6	8	17	9	9	0	9	14	8	12	0	0	1	2	0
June .	6.2	9.8	32	S.	SW	3	2	0	6	11	19	14	2	3	4	14	12	10	0	0	0	2	0
July .	5.8	9.8	36	SW.	SW.	8	5	5	6	5	18	5	9	1	8	13	10	13	0	0	0	1	0
Aug ..	4.5	8.4	38	S.	SW.	6	7	5	4	3	16	13	6	2	17	6	8	6	0	0	0	3	0
Sept .	6.1	11.4	36	NE.	SW.†	1	14	5	0	8	14	12	3	3	8	8	14	10	0	0	0	1	0
Oct ..	6.3	11.1	36	SW.	N.	14	9	0	5	8	8	7	10	1	8	10	13	10	0	0	0	0	0
Nov ..	6.4	11.8	40	SE.	W.	3	6	1	3	6	12	17	11	1	9	4	17	13	0	7	0	0	0
Dec ..	6.0	12.8	54	W.	W.	4	2	4	3	4	15	18	12	0	9	8	14	13	4	15	0	0	0
Year .	5.6	11.8	..	.....	SW.	66	82	39	50	71	153	151	106	12	102	124	139	131	19	75	1	11	0

BROWNSVILLE, TEX.

[H=57. T=17. h=1.]

Jan ..	6.6	9.9	40	S.	NW.†	10	2	14	4	8	4	6	14	0	3	21	7	11	0	0	0	0	0
Feb ..	7.9	9.5	32	N.	N.	20	3	11	9	10	0	0	3	0	2	12	14	11	0	0	0	0	0
Mar ..	5.0	9.0	34	S.	S.	9	7	10	9	12	1	6	7	1	13	10	8	8	0	0	0	0	0
Apr ..	4.4	9.7	36	S.†	SE.	9	2	12	16	15	2	4	0	0	8	22	0	3	0	0	1	1	0
May .	5.2	10.2	30	SE.†	SE.	5	8	8	23	15	0	0	3	0	8	16	7	6	0	0	0	5	0
June .	3.7	8.6	38	S.	SE.	0	0	9	34	16	0	1	0	0	13	15	2	6	0	0	4	1	0
July .	3.1	8.8	26	S.	SE.	0	0	4	37	18	0	0	0	3	19	11	1	3	0	0	22	0	0
Aug ..	4.6	5.5	25	NE.	SE.	1	11	17	23	2	0	1	0	7	7	21	3	13	0	0	16	7	0
Sept .	4.6	7.1	44	SE.	SE.	7	5	8	21	6	1	4	4	4	12	13	5	11	0	0	0	0	0
Oct ..	3.1	4.2	32	S.	SE.	5	6	11	16	7	0	0	8	9	23	7	1	2	0	0	0	0	0
Nov ..	5.1	7.5	40	S.	N.	13	7	8	11	6	3	3	6	3	11	11	8	7	0	0	0	0	0
Dec ..	5.5	8.5	38	S.	SE.	2	0	19	29	9	0	0	1	2	6	18	7	1	0	0	0	0	0
Year .	4.9	8.2	..	.....	SE.	81	51	131	232	124	11	25	46	29	125	177	63	82	0	0	43	14	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

BUFFALO, N. Y.

[Lat., 42° 53′ N.; Long., 78° 53′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	29.24	1.44	29.1	30.4	29.8	55	8	34.2	25.5	24	25	83	80	4.72	1.70
Feb ..	29.34	1.38	17.8	19.8	18.5	48	—10	25.6	11.4	13	15	83	82	2.29	.46
Mar ..	29.20	1.04	31.9	33.3	33.4	54	14	38.7	28.2	25	28	77	80	1.34	.90
Apr ..	29.26	1.18	41.7	43.4	43.4	74	28	50.6	36.1	32	33	71	70	3.42	1.28
May .	29.22	.62	53.8	54.9	54.6	89	34	61.3	47.8	44	43	71	67	2.77	1.32
June .	29.27	.82	60.6	62.3	61.9	83	45	68.1	55.7	54	54	80	75	5.27	1.72
July .	29.25	.61	68.3	70.8	69.9	88	54	76.7	63.1	60	62	76	74	3.58	1.18
Aug ..	29.34	.56	65.2	69.2	67.4	84	51	74.9	59.9	56	56	73	65	1.07	.35
Sept .	29.30	.89	59.3	63.5	62.6	86	41	70.4	54.9	52	54	77	72	4.09	1.27
Oct ..	29.32	.94	42.6	45.5	45.2	62	26	51.5	38.9	35	37	76	74	2.80	.85
Nov ..	29.28	1.27	39.4	41.5	40.6	65	20	45.3	35.9	33	35	80	78	5.06	.84
Dec ..	29.33	1.36	36.8	37.9	37.5	57	12	43.5	31.5	30	31	78	77	3.66	.62
Year .	29.28	1.01	45.5	47.7	47.1	89	—10	53.4	40.7	38	39	77	74	40.07	.....

FORT BUFORD, N. DAK.

[Lat., 48° N.; Long., 103° 56′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	27.98	.94	5.1	14.0	10.6	45	—18	23.0	—1.7	3	10	91	84	.13	.06
Feb ..	28.04	1.31	6.5	19.0	13.2	51	—32	23.6	2.8	4	13	91	80	.30	.14
Mar ..	28.01	.82	24.4	42.3	35.2	72	— 3	48.5	21.8	20	22	84	49	.20	.18
Apr ..	27.95	.92	39.1	58.7	48.7	76	15	63.0	34.4	28	25	67	29	.60	.42
May .	27.90	1.24	44.4	58.8	51.2	76	27	62.7	39.6	36	34	76	45	2.69	.80
June .	27.90	.71	55.3	74.0	63.7	101	38	78.4	49.0	45	42	71	35	1.03	.25
July .	27.92	.62	58.8	77.3	67.6	98	41	81.7	53.4	49	45	72	34	.63	.18
Aug ..	27.90	.73	57.0	80.1	68.8	99	42	85.0	52.6	46	44	70	30	.95	.44
Sept .	27.90	.90	43.0	59.9	52.8	87	26	67.0	38.7	35	34	76	42	1.13	.49
Oct ..	28.02	.80	35.6	52.9	47.2	89	15	63.0	31.4	27	28	74	41	.01	.01
Nov ..	28.04	1.07	16.0	27.1	23.5	61	—28	36.5	10.5	12	17	87	68	.37	.30
Dec ..	27.88	.89	11.5	16.7	14.1	44	—12	24.6	3.6	9	13	91	86	.42	.24
Year .	27.95	0.91	33.1	48.4	41.4	101	—32	54.8	28.0	26	27	79	52	8.46	.....

CAIRO, ILL.

[Lat., 37° 0′ N.; Long., 89° 10′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.70	1.01	34.7	40.3	38.0	61	19	44.6	31.5	30	32	84	73	4.61	1.90
Feb ..	29.82	1.20	30.5	39.0	35.6	70	6	43.0	28.2	24	24	78	60	1.57	.55
Mar ..	29.63	.88	43.5	53.2	50.0	75	27	59.6	40.5	34	34	72	52	1.40	.75
Apr ..	29.64	.80	53.9	63.6	59.6	81	34	69.3	49.8	44	42	70	48	0.97	.44
May .	29.62	.51	60.7	69.1	65.8	88	41	75.2	56.5	51	50	72	52	1.91	.72
June .	29.64	.56	66.7	72.7	70.8	90	46	78.8	62.8	62	62	85	70	8.07	1.86
July .	29.61	.39	73.8	78.3	77.4	91	62	84.7	70.0	70	70	87	77	5.15	1.77
Aug ..	29.71	.25	69.5	76.9	75.1	88	62	83.4	66.8	65	68	87	74	1.10	.54
Sept .	29.68	.71	61.4	68.7	67.0	88	45	75.8	58.3	58	63	89	81	3.82	.73
Oct ..	29.74	.77	48.7	58.5	56.6	83	36	66.0	47.3	45	49	88	70	2.81	1.12
Nov ..	29.74	1.06	40.4	45.5	44.2	73	20	49.6	38.8	35	37	83	75	5.56	2.96
Dec ..	29.76	.76	49.6	56.2	54.0	74	26	62.1	46.0	43	44	80	66	0.77	.46
Year .	29.69	0.74	52.8	60.2	57.8	91	6	66.0	49.7	47	48	81	66	37.74	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

BUFFALO, N. Y.

[H=690. T=103. h=93.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	7.1	14.5	78	SW.	SW.	1	9	5	3	10	20	12	0	2	4	8	19	15	11	22	0	0	0
Feb ..	7.6	15.0	62	SW.	SW.	3	2	3	2	11	19	15	1	0	4	5	19	18	18	27	0	0	0
Mar ..	5.5	10.6	40	SW.	SW.	4	16	7	0	2	23	8	2	0	4	18	9	11	6	20	0	2	0
Apr ..	5.8	9.4	48	SW.	SW.	7	12	3	2	3	24	6	3	0	9	8	13	10	0	5	0	1	0
May .	5.8	9.9	54	SW.	SW.	5	3	3	2	13	23	11	2	0	13	4	14	10	0	0	0	4	0
June .	6.3	9.9	40	SW.	SW.	0	9	2	2	7	35	4	0	1	4	16	10	18	0	0	0	7	0
July .	4.4	7.5	30	S.	SW.	1	6	3	3	10	26	5	6	2	10	16	5	11	0	0	0	3	0
Aug ..	4.5	9.2	40	SW.	SW.	4	8	3	2	11	20	9	5	0	12	12	7	8	0	0	0	1	0
Sept .	4.8	9.6	44	SW.	S.	1	14	8	1	15	10	10	1	0	11	10	9	14	0	0	0	3	0
Oct ..	5.6	9.3	39	SW.	N.	16	14	1	4	3	6	9	8	1	9	9	13	13	0	4	0	0	0
Nov ..	7.2	12.7	52	SW.	W.	3	11	0	10	5	9	16	6	0	4	9	17	18	2	8	0	0	0
Dec ..	7.1	15.7	72	W.	W.	1	8	7	3	9	10	21	3	0	3	11	17	20	4	11	0	1	0
Year .	6.0	11.1	..	.....	SW.	46	112	45	34	99	225	126	37	6	87	126	152	166	41	97	0	22	0

FORT BUFORD, N. DAK.

[H=1,900. T=17. h=3.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	4.3	7.0	38	NW.	NW.	2	2	8	5	2	11	6	25	1	8	19	4	6	23	31	0	0	0
Feb ..	5.8	9.5	52	NW.	NW.	5	3	7	1	5	11	4	19	1	5	11	12	8	18	28	0	0	1
Mar ..	5.4	8.2	35	NW.	NW.	7	6	12	4	2	12	6	13	0	5	18	8	3	4	28	0	0	1
Apr ..	5.4	10.8	66	NW.	W.†	3	8	11	8	4	4	11	9	2	2	16	12	4	0	8	0	1	2
May .	7.0	9.7	36	SE.	NW.	5	5	7	7	4	9	7	16	2	3	9	19	12	0	3	0	3	0
June .	5.1	8.1	36	NW.	NW.	5	6	10	4	4	10	7	14	0	5	17	8	9	0	0	5	6	0
July .	6.7	8.6	38	N.	NW.	6	5	15	5	3	2	5	18	3	3	13	15	10	0	0	6	5	0
Aug ..	3.3	7.1	48	NW.	E.	6	7	16	8	5	4	4	10	2	18	11	2	5	0	0	6	4	1
Sept .	6.0	9.5	48	NW.	NW.	3	5	6	3	8	3	9	20	3	5	12	13	10	0	5	0	0	0
Oct ..	4.9	7.9	42	NW.	E.	3	8	21	7	4	4	4	10	1	7	21	3	1	0	18	0	0	2
Nov ..	4.6	7.6	40	NW.	S.	4	5	9	5	13	8	4	12	0	10	14	6	4	10	30	0	0	2
Dec ..	5.5	7.2	37	NW.	E.	5	2	18	2	5	8	7	11	4	10	10	11	5	22	31	0	0	2
Year .	5.3	8.4	..	.....	NW.	54	62	140	59	59	86	74	177	19	81	171	113	77	77	182	17	19	11

CAIRO, ILL.

[H=359. T=88. h=78.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	5.7	7.7	35	E.	W.	11	4	2	2	12	6	16	7	2	7	9	15	13	2	17	0	0	0
Feb ..	5.8	9.2	36	N.	SW.†	11	6	3	7	2	11	9	7	0	8	8	12	11	4	17	0	1	0
Mar ..	4.2	8.8	45	N.	N.	19	6	3	4	4	7	10	8	1	14	8	9	8	0	3	0	1	0
Apr ..	4.4	9.4	37	S.	S.†	13	9	3	1	13	4	5	9	3	16	4	10	7	0	0	0	2	0
May .	3.5	8.7	36	NW.	S.	7	4	5	2	17	8	9	10	0	15	7	9	7	0	0	0	7	0
June .	6.7	6.2	43	SW.	S.	7	6	2	6	14	9	5	7	4	4	10	16	16	0	0	0	8	0
July .	6.5	5.1	45	W.	S.	6	7	3	3	16	9	4	10	4	7	12	12	13	0	0	3	12	0
Aug ..	2.9	4.7	35	SW.	S.	12	12	9	0	14	6	2	2	5	18	8	5	6	0	0	0	3	0
Sept .	5.5	5.5	33	W.	NW.†	6	11	7	6	5	5	1	11	8	9	8	13	11	0	0	0	5	0
Oct ..	3.9	6.3	40	SW.	N.	17	6	2	2	11	2	4	8	10	17	6	8	6	0	0	0	3	0
Nov ..	6.8	8.2	28	N.	N.	13	3	5	4	8	10	10	6	1	8	4	18	12	1	6	0	0	0
Dec ..	6.0	8.6	36	S.	S.	9	5	8	3	20	9	3	1	4	8	9	14	5	0	3	0	2	0
Year .	5.2	7.4	..	.....	S.	131	79	52	40	136	86	78	86	42	131	93	141	115	7	46	3	44	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

FORT CANBY, WASH.

[Lat., 46° 16′ N.; Long., 124° 4′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan	29.86	.87	42.5	44.9	42.4	57	32	46.5	38.4	37	39	84	81	9.36	2.89
Feb	29.96	.84	44.1	48.1	45.2	58	30	49.9	40.6	42	42	92	82	2.53	0.47
Mar	29.72	1.30	49.8	53.7	51.2	70	41	56.1	46.2	45	45	85	76	4.84	0.95
Apr	29.83	.83	48.7	52.6	51.0	65	41	55.7	46.3	46	46	89	79	4.01	0.74
May	29.78	1.03	52.8	57.5	55.1	78	43	60.5	49.7	50	51	90	80	3.30	0.75
June	29.86	.65	54.0	58.0	56.6	83	49	61.6	51.7	51	52	90	80	1.36	0.63
July	29.85	.49	55.4	59.6	58.3	80	50	63.2	53.5	54	55	94	85	0.24	0.07
Aug	29.85	.59	55.3	59.1	57.6	72	50	62.2	52.9	54	55	95	86	2.92	1.05
Sept	29.88	.72	55.6	59.8	57.8	86	46	63.2	52.5	51	51	86	78	4.78	2.10
Oct	29.72	.97	55.2	58.1	56.3	70	44	60.9	51.7	52	52	88	82	8.08	2.07
Nov	29.84	1.09	49.7	52.4	50.1	66	38	54.2	46.0	45	47	84	84	4.16	0.83
Dec	29.64	1.10	41.2	42.4	41.2	56	31	45.1	37.2	37	37	86	83	7.86	1.27
Year	29.82	0.87	50.4	53.8	51.9	86	30	56.6	47.2	47	48	89	81	53.44	.....

CARSON CITY, NEV.

[Lat., 39° 8′ N.; Long., 119° 47′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan	......	.....	22.2	38.4	31.0	55	—1	43.1	19.0	16	21	78	53	0.06	0.04
Feb	......	.....	26.1	46.4	36.5	62	1	50.3	22.7	19	15	78	32	0.13	0.08
Mar	......	.....	34.4	53.7	44.8	71	24	57.6	31.9	25	22	70	31	1.73	1.04
Apr	......	.....	41.2	60.7	52.3	77	27	65.5	39.1	27	23	59	26	0.03	0.01
May	......	.....	44.0	65.8	56.0	88	29	69.7	42.2	32	28	65	29	1.72	1.32
June	......	.....	50.4	78.4	66.6	92	41	84.4	48.8	35	32	58	22	0.27	1.15
July	......	.....	51.8	84.3	69.3	100	43	87.7	50.9	35	36	55	19	.00	.00
Aug	......	.....	51.1	82.9	68.2	93	40	86.7	49.7	32	28	48	14	.00	.00
Sept	......	.....	44.6	73.8	59.6	88	28	77.6	41.6	24	23	46	16	.00	.00
Oct	......	.....	38.8	57.3	49.2	85	21	62.9	35.6	27	27	66	37	1.04	0.44
Nov	......	.....	29.9	46.9	39.4	64	16	52.2	26.7	22	23	74	44	2.11	1.09
Dec	......	.....	29.8	35.0	32.9	52	—7	39.9	25.9	24	26	80	71	4.76	1.64
Year	......	....	38.7	60.3	50.5	100	—7	64.8	36.2	26	25	65	33	11.85	.....

CEDAR KEYS, FLA.

[Lat., 29° 8′ N.; Long., 83° 3′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan	30.07	.54	53.9	58.0	57.0	70	36	61.9	52.1	49	51	86	80	8.04	2.03
Feb	30.18	.61	50.1	54.5	54.0	70	34	59.6	48.3	45	49	84	81	3.35	1.22
Mar	29.98	.76	56.5	60.8	60.1	75	42	65.2	55.0	50	55	81	81	2.07	0.62
Apr	30.02	.57	65.7	68.3	68.1	82	48	73.0	63.2	60	62	83	82	1.47	0.84
May	30.04	.49	70.7	73.6	73.0	87	55	79.5	66.6	62	65	76	76	T.	T.
June	30.06	.51	75.9	78.2	78.6	89	56	84.1	73.0	71	72	85	82	5.29	1.66
July	30.04	.26	79.6	81.3	81.4	91	71	86.1	76.7	74	75	85	81	10.03	2.99
Aug	30.06	.24	77.5	80.2	80.4	89	69	86.4	74.4	73	74	86	82	4.98	1.62
Sept	30.00	.42	76.4	78.8	79.4	91	65	85.4	73.3	72	72	85	80	4.97	2.07
Oct	30.06	.41	64.9	70.8	68.8	85	49	75.9	61.8	59	62	81	76	1.61	0.81
Nov	30.12	.64	59.9	65.7	64.3	79	34	70.4	58.2	55	59	86	79	1.56	1.08
Dec	30.25	.32	58.5	63.8	63.4	77	41	70.3	56.6	56	60	92	89	.00	.00
Year	30.07	.48	65.8	69.5	69.0	91	34	74.8	63.3	60	63	84	81	43.37	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

FORT CANBY, WASH.

[H=179. T=10. h=2.]

Month and year.	Mean cloudiness (in tenths.)	Wind.													Number of days.								
		Average hourly vel. (miles).	Maximum (miles.)	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	6.2	13.9	54	SE.	SE.	8	3	3	32	4	4	6	2	0	7	6	18	20	0	0	0	1	0
Feb ..	6.0	10.8	64	SE.	SE.	8	3	2	21	8	1	6	2	5	5	6	17	15	0	2	0	1	0
Mar ..	6.2	13.1	72	S.	S.	7	1	0	14	23	2	6	2	7	5	9	17	21	0	0	0	0	0
Apr ..	6.8	12.5	66	S.	S.	11	3	0	7	17	1	10	8	3	5	8	17	15	0	0	0	0	0
May .	6.5	10.7	53	S.	W.	11	2	1	8	14	4	15	5	2	9	8	14	18	0	0	0	0	0
June .	4.8	11.0	64	S.	N.	25	3	0	0	10	1	3	15	3	15	3	12	9	0	0	0	0	0
July .	7.2	6.1	27	N.	N.	21	0	0	0	5	1	14	13	8	4	8	19	8	0	0	0	0	0
Aug ..	6.0	8.9	52	S.	N.	23	0	0	5	10	3	11	5	5	10	7	14	7	0	0	0	0	0
Sept .	5.0	10.8	76	S.	N.	21	1	4	5	13	1	6	4	5	10	10	10	11	0	0	0	0	0
Oct ..	7.2	11.8	72	S.	SE.	7	3	5	20	14	0	6	2	5	2	13	16	19	0	0	0	0	0
Nov ..	6.4	14.7	88	S.	SE.	9	1	3	19	14	2	6	2	4	7	5	18	17	0	0	0	0	0
Dec ..	6.3	13.0	60	SE.	SE.	6	4	1	31	3	3	6	4	4	7	8	16	22	0	2	0	0	0
Year .	6.2	11.4	..	.....	SE.	157	24	19	162	135	23	95	64	51	86	91	188	182	0	4	0	2	0

CARSON CITY, NEV.

[H= . T=21. h=42.]

Month and year.	Mean cloudiness (in tenths.)	Average hourly vel. (miles).	Maximum (miles.)	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	2.7	.....	..	.....	.....	...	...	...	...	...	...	...	...	...	14	16	1	3	0	29	0	0	0
Feb ..	3.0	.....	..	.....	.....	...	...	...	...	...	...	...	...	...	16	9	3	4	3	24	0	0	0
Mar ..	3.9	.....	..	.....	.....	...	...	...	...	...	...	...	...	...	14	11	6	7	0	15	0	0	0
Apr ..	4.4	.....	..	.....	.....	...	...	...	...	...	...	...	...	...	12	15	3	3	0	5	0	0	0
May .	3.4	.....	..	.....	.....	...	...	...	...	...	...	...	...	...	17	10	4	6	0	1	0	0	0
June .	2.0	.....	..	.....	.....	...	...	...	...	...	...	...	...	...	21	7	2	2	0	0	2	2	0
July .	0.6	.....	..	.....	.....	...	...	...	...	...	...	...	...	...	30	1	0	0	0	0	8	0	0
Aug ..	1.5	.....	..	.....	.....	...	...	...	...	...	...	...	...	...	25	6	0	0	0	0	6	0	0
Sept .	1.7	.....	..	.....	.....	...	...	...	...	...	...	...	...	...	23	6	1	0	0	4	0	0	0
Oct ..	5.1	.....	..	.....	.....	...	...	...	...	...	...	...	...	...	11	11	9	9	0	8	0	0	0
Nov ..	3.3	.....	..	.....	.....	...	...	...	...	...	...	...	...	...	19	5	6	5	0	24	0	0	0
Dec ..	7.6	.....	..	.....	.....	...	...	...	...	...	...	...	...	...	4	7	20	20	2	22	0	0	0
Year .	3.3	.....	..	.....	.....	...	...	...	...	...	...	...	...	...	206	104	55	59	5	132	16	2	0

CEDAR KEYS, FLA.

[H=22. T=42. h=33.]

Month and year.	Mean cloudiness (in tenths.)	Average hourly vel. (miles).	Maximum (miles.)	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	6.3	11.3	48	S.	NE.	9	22	6	6	5	0	2	11	1	4	7	20	11	0	0	0	0	0
Feb ..	6.2	10.9	37	NW.	NE.	12	18	4	4	6	1	1	9	1	6	10	12	11	0	0	0	0	0
Mar ..	3.2	11.0	35	S.	N.	17	6	5	2	5	1	10	15	1	18	6	7	10	0	0	0	0	0
Apr ..	3.2	8.8	42	NW.	NW.	10	9	3	2	4	4	9	19	0	17	7	6	8	0	0	0	1	0
May .	3.0	9.4	31	SW.	NW.	16	6	6	2	1	1	9	21	0	16	9	6	0	0	0	0	0	0
June .	6.5	9.1	43	E.	SE.	6	4	11	12	3	7	6	11	0	2	9	19	14	0	0	0	0	0
July .	3.6	8.0	36	S.	NW.	6	2	0	13	6	11	10	14	0	2	9	20	19	0	0	1	3	0
Aug ..	6.9	7.7	48	SE.	SE.	10	8	11	21	2	2	3	5	0	4	10	17	17	0	0	0	1	0
Sept .	4.8	9.0	42	SE.	NE.	10	18	11	8	2	2	4	5	0	12	11	7	14	0	0	1	0	0
Oct ..	3.5	8.0	30	NW.	N.	27	11	2	2	0	1	1	16	2	18	9	4	3	0	0	0	0	0
Nov ..	5.5	9.5	30	N.	N.	24	9	1	5	5	0	4	11	1	11	9	10	6	0	0	0	0	0
Dec ..	3.9	5.8	20	NE.	N.	19	15	2	3	1	0	5	16	1	17	11	3	0	0	0	0	0	0
Year .	5.0	9.0	..	.....	N..	166	128	62	80	40	30	64	153	7	127	10	131	113	0	0	2	5	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

CHARLESTON, S. C.

[Lat., 32° 47′ N.; Long., 79° 56′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	30.03	.90	48.1	51.9	51.6	71	29	58.1	45.2	43	45	84	78	6.46	1.62
Feb ..	30.14	.93	43.5	47.9	47.4	70	26	53.8	40.9	37	40	80	76	4.54	1.32
Mar ..	29.90	1.05	50.4	55.0	55.0	74	34	62.4	47.5	45	48	82	78	7.49	3.14
Apr ..	29.94	.76	61.0	61.7	63.5	85	42	71.9	55.1	53	53	78	77	2.41	.99
May .	29.96	.48	70.1	72.2	73.6	96	49	82.9	64.4	58	61	66	69	.98	.50
June .	30.04	.56	75.1	75.4	76.8	95	51	83.5	70.2	68	68	80	79	5.96	2.39
July .	30.00	.31	80.3	79.1	81.4	97	71	87.4	75.5	73	74	80	86	6.74	4.34
Aug ..	30.06	.28	76.0	76.7	78.0	90	66	84.2	71.7	72	72	86	84	7.36	4.08
Sept .	30.00	.55	73.3	75.3	75.8	91	58	82.7	68.8	66	68	78	78	2.17	1.48
Oct ..	30.02	.56	60.2	64.5	64.7	86	43	73.4	56.0	55	57	82	77	.73	.68
Nov ..	30.09	.89	56.7	59.1	60.0	79	31	66.8	53.2	53	53	86	81	7.28	5.84
Dec ..	30.21	.53	53.4	57.9	60.0	78	37	68.4	51.5	50	53	90	84	.03	.03
Year .	30.03	.65	62.3	64.7	65.6	97	26	73.0	58.3	56	58	81	79	52.15	....

CHARLOTTE, N. C.

[Lat., 35° 13′ N.; Long., 80° 51′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.22	.99	37.7	45.2	44.1	70	22	52.5	35.7	28	34	71	66	6.15	1.56
Feb ..	29.31	1.10	33.3	40.6	39.4	69	13	48.9	30.0	26	29	74	67	4.59	1.38
Mar ..	29.11	1.00	44.5	51.3	51.0	75	28	61.7	40.3	38	41	79	68	1.62	.58
Apr ..	29.15	.83	55.2	62.7	61.2	86	38	72.2	50.2	48	49	77	63	2.60	1.00
May .	29.16	.55	65.9	71.7	70.4	95	38	82.9	57.8	56	55	71	57	2.75	1.97
June .	29.25	.54	69.4	72.9	73.4	94	45	83.3	63.5	64	65	85	78	10.54	2.79
July .	29.21	.45	74.0	76.9	78.8	96	61	88.0	69.5	69	70	86	81	8.17	2.30
Aug ..	29.30	.36	69.8	72.6	74.0	90	58	82.5	65.5	66	68	89	84	4.53	1.58
Sept .	29.24	.67	65.7	69.2	70.1	89	45	79.9	60.3	60	61	82	76	2.88	1.42
Oct ..	29.24	.62	52.7	58.8	58.5	82	34	69.8	47.2	45	47	78	67	1.53	.83
Nov ..	29.27	1.02	46.7	51.5	51.8	77	21	60.4	43.3	42	42	85	71	4.44	1.90
Dec ..	29.38	.66	47.4	55.7	54.7	76	27	64.4	45.0	43	45	85	70	.48	.32
Year .	29.24	.73	55.2	60.8	60.6	96	13	70.5	50.7	49	50	80	71	50.28	....

CHATTANOOGA, TENN.

[Lat., 35° 4′ N.; Long., 85° 15′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.26	.99	37.0	44.7	42.6	64	20	51.8	33.3	32	34	81	69	5.31	1.22
Feb ..	29.36	.93	35.8	43.9	41.7	71	13	51.3	32.1	28	32	75	64	5.10	3.36
Mar ..	29.16	.87	44.6	55.7	51.6	80	26	62.4	40.7	37	38	76	54	3.71	2.04
Apr ..	29.20	.69	55.5	64.9	62.2	86	37	73.7	50.8	48	51	76	63	3.21	1.83
May .	29.22	.68	60.6	69.8	66.2	91	41	78.6	53.8	53	54	76	58	4.59	2.75
June .	29.25	.46	67.5	73.2	72.2	87	39	81.5	62.8	63	66	86	78	4.16	1.16
July .	29.23	.39	74.7	79.0	78.4	92	63	87.2	69.6	69	71	83	76	3.33	.87
Aug ..	29.31	.30	69.5	75.6	74.8	91	57	84.2	65.5	66	69	88	81	3.77	1.11
Sept .	29.28	.64	63.6	69.3	69.1	89	40	78.4	59.8	59	62	85	78	7.87	2.87
Oct ..	29.30	.61	50.3	59.7	58.4	82	35	69.4	47.4	45	50	84	71	1.38	.48
Nov ..	29.31	.98	45.0	50.7	50.1	73	23	58.3	41.9	40	42	83	73	6.44	1.74
Dec ..	29.42	.59	50.8	58.9	57.2	73	25	66.8	47.6	46	50	85	74	.44	.31
Year .	29.28	.68	54.6	62.1	60.4	92	13	70.3	50.4	49	52	82	70	49.31	....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

CHARLESTON, S. C.

[H=52. T=62. h=55.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
1889.																							
Jan ..	7.0	9.2	26	SE.	W.	12	10	6	2	1	11	14	6	0	5	6	20	15	0	1	0	0	0
Feb ..	6.8	9.5	30	SW.	W.	9	11	3	1	0	12	14	6	0	4	10	14	12	0	1	0	0	0
Mar ..	4.8	7.2	34	NE.	N.	12	5	6	1	3	9	8	11	7	13	8	10	12	0	0	0	1	0
Apr ..	4.2	6.4	47	E.	SW.	8	6	3	3	3	14	9	5	9	19	5	6	7	0	0	0	2	0
May .	2.4	9.4	36	SE.†	SW.	11	1	5	1	4	20	9	11	0	22	8	1	5	0	0	5	2	0
June .	6.6	8.9	35	E.	S.	6	4	7	4	15	13	9	2	0	7	7	16	10	0	0	5	2	0
July .	6.4	9.3	26	NW.	SW.	1	4	6	2	8	33	7	1	0	7	8	16	15	0	0	11	6	0
Aug .	7.4	5.8	30	SW.	SW.	8	9	10	5	5	13	3	2	7	3	4	24	15	0	0	0	4	0
Sept .	4.9	7.8	45	SE.	SW.	9	10	9	6	5	11	6	4	0	14	9	7	4	0	0	1	0	0
Oct ..	2.6	6.7	30	N.	N.	22	4	5	4	2	12	8	4	1	20	8	3	3	0	0	0	0	0
Nov ..	3.1	6.6	38	NE.	W.	4	10	6	1	3	9	11	8	8	18	6	6	6	0	1	0	0	0
Dec ..	1.7	5.8	24	NE.	SW.†	9	7	1	1	1	17	17	5	4	24	5	2	1	0	0	0	0	0
Year .	4.8	7.7	...	.....	SW.	111	81	67	31	50	174	115	65	36	156	84	125	105	0	3	22	17	0

CHARLOTTE, N. C.

[H=808. T=56. h=47.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
Jan ..	5.2	5.5	45	SW.	NE.†	11	11	0	3	10	10	5	7	5	10	8	13	12	0	5	0	0	0
Feb ..	4.2	6.0	24	SW.†	SW.	5	10	4	1	8	12	8	6	2	8	12	8	7	1	16	0	1	0
Mar ..	4.0	6.0	23	NE.	W.	8	8	6	0	6	5	12	10	7	13	7	11	8	0	2	0	0	0
Apr ..	4.2	6.8	28	NW.	NE.†	4	9	7	7	6	3	9	3	12	14	8	8	9	0	0	0	2	0
May .	2.9	4.8	34	SE.	SE.†	9	7	4	9	4	5	8	7	9	18	8	5	4	0	0	6	3	0
June .	5.8	4.9	32	SW.	S.	3	9	1	4	16	9	8	8	2	7	9	14	15	0	0	4	5	0
July .	5.6	4.7	20	SE.	S.	0	11	8	11	13	8	6	4	1	8	13	10	13	0	0	10	10	0
Aug ..	5.6	3.9	20	SW.	NE.	7	14	5	2	13	9	4	0	8	10	9	12	11	0	0	0	1	0
Sept .	5.1	4.6	25	NE.	NW.	6	12	8	2	12	2	2	13	3	10	11	9	6	0	0	0	0	0
Oct ..	3.6	5.1	24	N.	N.	20	8	1	2	3	12	8	6	2	16	11	4	4	0	0	0	0	0
Nov ..	5.2	6.1	28	S.	SW.	8	12	2	3	11	13	5	4	2	11	10	9	10	0	4	0	0	0
Dec ..	3.9	4.6	20	SW.	SW.	1	9	2	2	14	16	9	5	4	18	7	6	3	0	2	0	0	0
Year .	4.6	5.2	...	.....	NE.	82	120	48	46	116	104	84	73	57	143	113	109	102	1	29	20	22	0

CHATTANOOGA, TENN.

[H=783. T=71. h=60.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
Jan ..	5.4	5.7	40	W.	NW.	10	8	6	8	3	4	9	11	3	12	4	15	15	1	14	0	0	0
Feb ..	5.0	6.8	26	SW.	NW.	7	6	3	10	6	6	6	11	1	9	10	9	6	1	14	0	2	0
Mar ..	3.4	6.2	26	NW.	NW.	8	11	6	6	3	10	4	14	0	15	8	8	7	[illegible]	3	0	2	0
Apr ..	3.4	6.3	36	NW.	W.	9	4	3	1	4	10	17	12	0	17	6	7	8	0	0	0	3	0
May .	3.0	5.1	30	W.†	W.	2	7	3	4	5	5	23	12	1	12	15	4	10	0	0	1	5	0
June .	5.7	3.9	36	NW.	NE.	4	11	3	4	6	10	10	7	5	6	11	13	19	0	0	0	12	0
July .	6.4	4.2	25	N.	W.	5	9	1	4	6	8	18	7	4	5	13	13	14	0	0	5	8	0
Aug ..	5.1	3.5	25	E.	NW.	6	9	2	4	11	4	6	20	0	11	10	10	18	0	0	1	11	0
Sept .	4.6	4.5	26	NE.	NW.	6	8	2	4	4	4	6	23	3	15	6	9	14	0	0	0	2	0
Oct ..	4.2	5.1	24	N.	N.	15	6	1	2	5	6	11	14	2	16	8	7	8	0	0	0	2	0
Nov ..	6.7	6.6	36	NW.	SW.	7	10	2	5	7	14	3	10	2	6	11	13	19	0	3	0	0	0
Dec ..	5.3	5.1	22	SW.	S.	6	9	0	3	17	15	9	2	1	10	13	8	7	0	2	0	0	0
Year .	4.8	5.2	...	.....	NW.	85	98	32	55	77	96	122	143	22	134	115	116	145	2	36	7	47	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

CHEYENNE, WYO.

[Lat., 41° 08′ N.; Long., 104° 48′ W.]

Month and year.	Pressure.		Temperature.							Dew-point.		Relative humidity.		Precipitation.	
	Mean.	Range.	8 a.m.	8 p.m.	Mean (max. and min.).	Maximum.	Minimum.	Mean. Maximum.	Mean. Minimum.	8 a.m.	8 p.m.	8 a.m.	8 p.m.	Total.	Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	23.92	.81	18.3	24.0	24.7	51	0	36.2	13.2	2	4	54	49	.23	.08
Feb ..	23.96	.82	19.1	26.1	24.8	54	—16	35.6	14.0	6	9	60	53	.62	.24
Mar ..	24.00	.79	28.4	43.9	38.4	62	15	51.5	25.4	15	11	61	32	.26	.19
Apr ..	24.02	.67	38.4	50.5	45.6	72	22	56.9	34.4	23	21	60	41	1.24	.27
May .	23.98	.87	42.5	53.6	49.5	78	24	61.2	37.8	31	32	67	51	2.85	1.45
June .	24.08	.43	53.1	64.7	59.0	87	31	72.1	45.8	41	40	66	46	3.67	1.22
July .	24.10	.39	59.8	74.6	68.2	95	38	82.7	53.6	42	38	56	32	1.23	.57
Aug ..	24.13	.38	57.1	74.8	68.1	92	42	83.1	53.1	42	37	61	30	.71	.25
Sept .	24.08	.58	44.4	61.6	55.0	87	28	69.5	40.6	23	22	50	27	.54	.47
Oct ..	24.10	.59	38.6	50.8	48.1	81	22	60.3	35.9	23	25	60	48	2.58	.87
Nov ..	24.06	.59	25.7	29.8	30.2	61	1	40.0	20.4	13	16	62	59	.56	.46
Dec ..	23.92	.69	32.2	35.2	36.5	60	6	47.1	25.9	16	15	54	47	.16	.08
Year .	24.03	0.63	38.1	49.1	45.7	95	—16	58.0	33.3	23	22	59	43	14.65	....

CHICAGO, ILL.

[Lat., 41° 52′ N.; Long., 87° 38′ W.]

Month	Pressure Mean	Pressure Range	Temp. 8 a.m.	Temp. 8 p.m.	Mean (max. and min.)	Maximum	Minimum	Mean Maximum	Mean Minimum	Dew-point 8 a.m.	Dew-point 8 p.m.	Rel. hum. 8 a.m.	Rel. hum. 8 p.m.	Precip. Total	Max. in 24 hours
Jan ..	29.22	1.46	25.8	30.9	29.0	55	0	35.0	23.0	22	26	84	81	1.64	.68
Feb ..	29.34	1.47	16.3	21.9	19.9	48	—11	26.8	13.0	12	17	84	81	1.31	.44
Mar ..	29.24	.67	34.3	39.2	38.4	68	20	44.7	32.1	28	30	81	71	1.43	.93
Apr ..	29.25	.86	44.0	47.1	46.8	73	29	52.9	40.7	37	39	77	74	2.35	1.03
May .	29.19	.53	52.4	57.0	56.8	88	36	64.5	49.1	43	46	72	70	5.38	1.42
June .	29.22	.73	59.9	62.5	62.3	86	42	69.5	55.1	54	54	82	76	2.93	.68
July .	29.22	.52	68.5	71.6	70.5	90	54	77.2	63.8	60	61	75	70	9.56	4.02
Aug ..	29.32	.47	66.4	72.7	70.6	88	54	77.8	63.3	55	59	68	63	0.39	.16
Sept .	29.26	.74	58.2	64.8	62.8	84	35	69.9	55.7	50	52	74	64	2.75	2.08
Oct ..	29.37	.84	45.7	51.6	49.4	79	35	55.2	43.5	38	40	74	66	1.82	.82
Nov ..	29.30	1.07	35.9	39.5	38.6	57	12	43.1	34.0	32	34	86	80	3.49	1.47
Dec ..	29.28	1.16	37.9	41.8	40.6	64	15	47.2	34.1	31	34	78	74	1.90	0.95
Year .	29.27	0.88	45.4	50.0	48.8	90	—11	55.3	42.3	38	41	78	72	34.95	....

CINCINNATI, OHIO.

[Lat., 39° 6′ N.; Long., 84° 30′ W.]

Month	Pressure Mean	Pressure Range	Temp. 8 a.m.	Temp. 8 p.m.	Mean (max. and min.)	Maximum	Minimum	Mean Maximum	Mean Minimum	Dew-point 8 a.m.	Dew-point 8 p.m.	Rel. hum. 8 a.m.	Rel. hum. 8 p.m.	Precip. Total	Max. in 24 hours
Jan ..	29.38	1.28	34.4	38.6	37.2	58	19	43.4	30.9	28	30	76	73	2.38	0.83
Feb ..	29.48	1.20	26.3	33.2	30.3	68	6	38.6	22.0	19	24	74	69	1.72	0.60
Mar ..	29.32	.78	39.8	49.4	45.8	76	25	54.8	36.7	29	34	67	58	0.61	0.36
Apr ..	29.34	.89	48.2	59.9	54.4	83	25	64.3	44.5	37	36	66	43	1.21	0.98
May .	29.32	.74	57.3	67.8	62.8	90	38	72.8	52.8	46	48	67	52	2.52	1.54
June .	29.36	.58	65.6	73.4	69.6	88	39	77.9	61.4	58	59	76	62	4.03	1.14
July .	29.34	.48	70.7	78.6	75.5	92	61	84.2	66.8	65	65	82	64	4.55	2.40
Aug ..	29.44	.34	66.7	77.5	72.3	92	56	82.6	62.0	58	58	74	51	0.26	0.13
Sept .	29.40	.68	59.8	69.2	66.2	92	40	75.0	57.5	53	54	80	61	4.31	1.50
Oct ..	29.46	.68	45.9	54.7	51.6	80	30	59.7	43.4	40	41	79	62	2.03	0.95
Nov ..	29.43	1.02	40.4	43.9	43.1	72	20	49.4	36.8	36	36	84	74	5.28	1.10
Dec ..	29.49	.78	44.6	50.0	48.2	69	21	56.6	39.7	38	42	80	74	2.02	0.93
Year .	29.40	0.79	50.0	58.0	54.8	92	6	63.3	46.2	42	44	75	62	30.92	....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

CHEYENNE, WYO.

[H=6,105. T=58. h=50.]

Month and year.	Mean cloudiness (in tenths).	Wind.													Number of days.								
		Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan	2.6	11.2	48	NW.	NW.	15	2	0	1	4	5	10	25	0	12	13	6	6	8	31	0	0	0
Feb	4.2	13.8	50	NW.	N.	20	0	0	2	5	3	8	18	0	3	14	11	6	8	27	0	0	0
Mar	3.0	10.1	42	NW.	NW.	19	6	0	2	6	3	4	22	0	7	13	11	3	0	28	0	0	0
Apr	5.4	11.7	44	NW.	N.	12	4	2	8	9	9	5	10	1	5	9	16	9	1	6	0	4	0
May	6.2	11.2	52	NW.	NW.	10	10	2	3	10	2	9	16	0	4	8	19	13	0	4	0	4	0
June	4.6	9.3	44	S.	NW.	15	3	1	3	9	3	6	19	1	4	16	10	12	0	1	0	9	0
July	5.2	9.4	36	SW.	NW.	11	4	1	4	10	6	4	18	4	9	15	7	8	0	0	5	6	0
Aug	5.8	7.2	40	NW.	NW.	3	4	2	3	14	5	7	18	6	8	9	14	10	0	0	2	10	0
Sept	5.4	10.8	42	S.	NW.	11	2	1	2	10	6	5	22	1	10	12	8	2	0	5	0	0	0
Oct	5.8	8.8	46	NW.	NW.	10	3	1	4	6	9	9	20	0	7	14	10	10	1	5	0	1	0
Nov	4.7	11.5	42	NW.	NW.	6	2	0	0	3	7	14	28	0	14	5	11	3	7	27	0	0	0
Dec	5.8	9.8	48	W.	W.	6	0	0	2	6	7	23	13	5	8	9	14	4	3	25	0	0	0
Year	4.9	10.4	..	.....	NW.	138	40	10	34	92	65	104	229	18	91	137	137	86	28	159	7	34	0

CHICAGO, ILL.

[H=715. T=146. h=134.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	4.6	10.5	44	SW.	SW.	2	3	5	4	1	25	7	12	3	10	8	13	5	11	28	0	0	0
Feb	5.6	11.0	32	SW.	W.	1	4	2	2	4	13	15	14	1	4	13	11	13	16	27	0	0	0
Mar	4.6	10.7	40	N.	W.†	12	12	2	7	0	6	12	10	1	9	15	7	5	2	11	0	1	0
Apr	4.8	11.0	36	SW.	NE.	5	15	9	9	2	10	3	7	0	10	9	11	8	0	1	0	3	0
May	6.1	13.1	48	N.	NE.†	15	15	1	2	9	10	3	6	1	4	15	12	14	0	0	0	6	0
June	6.3	7.8	28	NW.	SW.	8	11	5	6	4	13	8	4	1	1	13	16	12	0	0	0	5	0
July	4.5	8.0	36	SW.	SW.	4	13	10	5	3	16	5	6	0	14	8	9	12	0	0	0	7	0
Aug	3.7	7.1	25	SW.	SW.	3	10	3	7	8	20	5	5	1	15	11	5	7	0	0	0	3	0
Sept	5.4	7.8	28	NW.	SW.	2	7	4	9	8	13	3	12	2	8	11	11	7	0	0	0	1	0
Oct	4.9	9.5	32	NE.	NE.	9	12	5	8	5	8	3	12	0	14	7	10	7	0	0	0	1	0
Nov	6.9	10.4	37	W.	NW.	4	9	5	5	4	16	2	14	1	5	9	16	17	3	11	0	0	0
Dec	5.9	10.3	36	NW.	SW.	2	3	3	11	3	24	8	7	1	10	9	12	10	1	7	0	0	0
Year	5.3	9.8	..	.....	SW.	67	114	54	75	51	174	74	109	12	104	128	133	117	33	85	0	27	0

CINCINNATI, OHIO.

[H=628. T=153. h=145.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	6.0	8.4	48	SW.	SE.	3	8	4	15	3	7	6	14	2	6	10	15	11	3	17	0	0	0
Feb	5.3	8.1	27	NW.	NW.	1	3	7	10	2	7	4	20	2	5	14	9	8	6	21	0	0	0
Mar	5.8	6.9	44	SW.	NW.	12	10	4	5	1	6	4	13	7	6	10	15	4	0	4	0	0	0
Apr	5.3	8.3	34	SW.	NE.	10	17	4	9	3	6	3	7	1	9	13	8	6	0	1	0	1	0
May	5.0	5.6	36	NW.	SE.	11	3	2	15	5	9	4	9	4	7	13	11	14	0	0	0	3	0
June	6.1	5.9	32	SW.	SE.	2	5	6	13	6	10	8	9	1	1	16	13	13	0	0	0	2	0
July	6.0	5.0	32	NW.	SW.	7	7	7	11	9	8	7	6	0	7	15	9	11	0	0	6	4	0
Aug	4.9	5.4	23	NW.	E.	9	8	12	9	6	8	5	4	1	11	14	6	5	0	0	1	1	0
Sept	6.3	5.8	24	NW.	SE.	10	9	3	15	8	4	4	5	2	7	9	14	9	0	0	1	1	0
Oct	6.0	6.9	26	N.	N.	19	12	5	9	6	6	2	2	1	13	4	14	8	0	1	0	1	0
Nov	8.2	7.3	28	NW.	NW.†	9	8	5	10	1	5	10	8	4	6	3	21	17	0	7	0	0	0
Dec	6.7	6.3	34	SW.	SW.	5	2	5	2	6	14	6	3	19	6	9	16	11	0	4	0	1	0
Year	6.0	6.7	..	.....	SE.	98	92	64	123	56	90	63	100	44	84	130	151	117	9	55	8	14	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

CLEVELAND, OHIO.

[Lat., 41° 31′ N.; Long., 81° 42′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan	29.20	1.31	30.0	33.1	32.6	57	13	38.5	26.8	25	26	82	76	3.13	1.16
Feb	29.30	1.27	20.1	25.1	23.2	56	— 7	30.2	16.3	14	17	79	71	1.24	.27
Mar	29.16	.86	34.7	38.1	37.4	64	22	44.1	30.8	27	28	75	71	2.07	1.63
Apr	29.21	1.04	45.4	47.6	46.7	83	25	54.2	39.2	37	36	73	67	1.99	.60
May	29.17	.59	56.3	61.8	59.1	89	34	67.7	50.5	45	46	67	59	4.13	1.88
June	29.22	.72	63.3	67.3	65.4	88	41	72.7	58.2	56	57	76	70	1.65	.92
July	29.20	.55	68.8	74.2	71.0	92	53	79.5	62.6	62	64	78	73	4.32	1.36
Aug	29.30	.52	64.4	71.0	68.2	88	50	77.1	59.4	56	57	75	62	1.23	.40
Sept	29.24	.72	59.4	64.2	63.2	89	43	71.2	55.3	52	55	78	72	4.29	1.50
Oct	29.29	.81	46.0	48.9	47.6	72	29	53.8	41.3	37	40	71	72	1.56	.71
Nov	29.25	1.16	39.9	42.4	41.8	66	18	47.3	36.3	35	34	82	74	3.72	1.08
Dec	29.30	.96	40.5	42.2	42.0	66	19	49.2	34.7	33	32	77	70	3.24	.70
Year	29.24	.88	47.4	51.3	49.8	92	— 7	57.1	42.6	40	41	76	70	32.57	.....

COLORADO SPRINGS, COLO.

[Lat., 38° 51′ N.; Long., 104° 47′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan	......	.....	16.4	25.5	25.4	55	— 4	39.1	11.7	3	12	58	60	.16	.12
Feb	......	.....	20.0	31.7	28.1	56	— 8	42.1	14.1	7	18	60	62	.60	.42
Mar	......	.....	31.3	47.5	41.0	68	18	54.1	27.8	20	27	65	48	.12	.06
Apr	......	.....	41.6	55.3	49.4	76	26	61.9	36.8	28	33	62	47	1.17	.41
May	......	.....	48.2	59.5	53.8	79	31	66.2	41.4	34	37	61	49	2.34	1.09
June	......	.....	56.8	68.5	62.2	91	36	76.0	48.3	41	45	57	46	1.77	.56
July	......	.....	62.9	76.5	69.8	96	45	83.8	55.9	48	50	61	44	2.88	1.26
Aug	......	.....	61.5	75.1	70.8	94	47	85.2	56.5	48	52	63	47	1.49	.47
Sept	......	.....	48.6	64.4	58.2	90	28	72.6	43.8	32	41	56	46	.86	.78
Oct	......	.....	40.6	52.8	50.0	81	23	61.8	38.1	30	35	70	55	2.08	.90
Nov	......	.....	25.3	31.6	31.8	62	6	42.5	21.1	17	19	72	62	.16	.08
Dec	......	.....	30.7	40.3	40.8	68	5	54.0	27.6	24	24	77	54	.14	.14
Year	......	.....	40.3	52.4	48.4	96	— 8	61.6	35.3	28	33	64	52	13.77	.....

COLUMBUS, OHIO.

[Lat., 39° 58′ N.; Long., 83° 0′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan	29.15	1.31	31.1	35.2	34.2	56	16	40.4	27.9	26	28	81	76	3.37	.77
Feb	29.25	1.21	22.0	28.8	26.4	62	1	33.2	19.5	16	21	79	75	1.06	.25
Mar	29.10	.86	36.0	44.5	42.2	74	21	51.2	33.1	27	30	73	61	.66	.20
Apr	29.13	.96	47.3	54.9	51.8	82	22	61.6	42.1	37	38	68	54	.83	.38
May	29.10	.67	56.9	63.4	61.4	91	36	71.6	51.3	48	48	74	60	3.92	1.27
June	29.14	.64	63.9	69.3	67.7	86	42	76.3	59.1	57	58	80	70	2.77	.57
July	29.11	.52	69.9	76.1	74.1	92	56	84.0	64.2	62	62	77	64	2.94	.70
Aug	29.22	.43	65.4	73.9	70.2	91	51	81.0	59.5	57	55	74	54	1.59	.64
Sept	29.18	.71	58.8	65.3	63.8	91	38	73.3	54.2	52	53	79	66	3.34	1.54
Oct	29.22	.65	43.7	50.9	49.0	78	29	57.3	40.8	37	38	77	62	1.83	.81
Nov	29.18	1.12	38.8	42.1	41.2	67	21	47.2	35.3	34	34	84	75	3.83	.95
Dec	29.25	.81	41.1	45.7	44.6	67	20	52.3	36.9	34	37	76	72	2.36	1.36
Year	29.17	.82	47.9	54.2	52.2	92	1	60.8	43.7	41	42	77	66	28.50	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

CLEVELAND, OHIO.

[H=761. T=118. h=111.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan	6.8	10.8	41	SW.	S.	2	5	4	4	17	12	13	4	1	8	6	17	12	5	24	0	0	0
Feb	7.5	11.1	32	W.	W.	2	2	7	3	9	8	15	10	0	2	7	19	10	14	25	0	0	0
Mar	5.4	7.5	24	W.	NW.	5	6	4	5	8	6	10	18	0	9	10	12	9	2	16	0	1	0
Apr	5.8	8.1	36	NW.	W.	8	8	6	6	7	5	12	7	1	7	12	11	10	0	5	0	1	0
May	5.2	7.7	28	W.	S.	5	7	1	1	17	13	7	10	1	11	13	7	12	0	0	0	4	0
June	6.5	7.7	26	S.	SW.	0	2	6	6	11	13	11	6	5	5	18	7	18	0	0	0	3	0
July	3.6	5.8	33	S.	SW.	1	6	6	8	10	13	7	7	4	17	7	7	10	0	0	1	5	0
Aug	3.3	6.1	20	SW.	SE.	4	4	3	17	8	15	4	3	4	16	10	5	6	0	0	0	2	0
Sept	5.5	8.6	29	SW.	SE.	3	4	5	14	8	10	6	9	1	11	4	15	14	0	0	0	3	0
Oct	6.3	9.1	30	NW.	N.	10	9	3	9	10	9	4	8	0	11	2	18	11	0	1	0	1	0
Nov	7.8	6.8	29	S.	SW.	2	5	3	7	9	16	10	7	1	3	7	20	18	1	7	0	0	0
Dec	6.0	9.6	36	SW.	SW.	2	2	1	7	11	20	9	10	0	10	8	13	16	1	8	0	1	0
Year	5.8	8.2	...	......	SW.	44	60	49	87	125	140	108	99	18	110	104	151	146	23	86	1	21	0

COLORADO SPRINGS, COLO.

[H=—. T=12. h=2.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	3.2	...	...	......	......	..	..	..	..	...	...	...	...	..	17	8	6	4	8	31	0	0	0
Feb	3.5	...	...	......	......	..	..	..	..	...	...	...	...	..	11	11	6	7	6	27	0	0	0
Mar	4.3	...	...	......	......	..	..	..	..	...	...	...	...	..	9	13	9	4	0	25	0	1	0
Apr	4.9	...	...	......	......	..	..	..	..	...	...	...	...	..	11	10	9	12	0	3	0	4	0
May	5.5	...	...	......	......	..	..	..	..	...	...	...	...	..	7	16	8	9	0	2	0	3	0
June	3.4	...	...	......	......	..	..	..	..	...	...	...	...	..	15	10	5	13	0	0	1	8	0
July	3.0	...	...	......	......	..	..	..	..	...	...	...	...	..	19	12	0	9	0	0	4	8	0
Aug	3.7	...	...	......	......	..	..	..	..	...	...	...	...	..	13	17	1	12	0	0	2	11	0
Sept	3.3	...	...	......	......	..	..	..	..	...	...	...	...	..	17	11	2	4	0	1	1	0	0
Oct	3.9	...	...	......	......	..	..	..	..	...	...	...	...	..	18	6	7	7	1	7	0	0	0
Nov	3.9	...	...	......	......	..	..	..	..	...	...	...	...	..	15	10	5	3	7	27	0	0	0
Dec	2.6	...	...	......	......	..	..	..	..	...	...	...	...	..	19	11	1	1	1	21	0	0	0
Year	3.8	...	...	......	......	..	..	..	..	...	...	...	...	..	171	135	59	85	23	144	8	35	0

COLUMBUS, OHIO.

[H=837. T=94. h=76.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	6.4	8.3	49	SW.	W.	6	3	4	7	8	13	16	3	2	6	11	14	13	5	25	0	0	0
Feb	5.8	9.8	37	W.	W.	7	1	6	5	11	8	14	4	0	7	12	9	14	11	25	0	0	0
Mar	4.6	8.2	40	SW.	NW.	8	5	6	5	4	4	12	18	0	12	11	8	10	1	10	0	0	0
Apr	5.4	8.2	38	W.	N.	12	10	6	3	7	5	6	11	0	9	7	14	7	0	3	0	2	0
May	5.6	6.1	31	NW.	S.	5	3	3	3	16	12	6	14	0	5	17	9	12	0	0	1	6	0
June	6.8	5.2	24	SW.	S.	3	2	5	2	20	11	6	11	0	4	13	13	14	0	0	0	6	0
July	5.6	4.4	36	SW.	S.	10	4	9	1	14	6	8	10	0	9	13	9	12	0	0	4	7	0
Aug	3.1	4.9	24	SW.	N.	14	9	3	9	12	6	2	7	0	21	5	5	8	0	0	1	2	0
Sept	4.7	5.3	40	W.	S.	5	9	4	8	11	6	4	10	3	10	13	7	10	0	0	1	1	0
Oct	5.3	6.6	26	W.	N.	13	4	4	4	7	6	11	11	2	12	8	11	9	0	3	0	0	0
Nov	7.2	8.1	27	SW.	W.	3	4	6	5	16	6	18	2	0	5	7	18	17	2	9	0	0	0
Dec	5.7	6.9	38	SW.	S.	5	1	2	6	26	8	9	3	2	8	11	12	10	0	8	0	1	0
Year	5.5	6.8	...	......	S.	91	55	58	58	152	91	112	104	9	108	128	129	136	19	83	7	25	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

CONCORDIA, KANS.

[Lat., 39° 35′ N.; Long., 97° 41′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan	28.58	1.01	20.7	31.2	29.0	56	3	39.3	18.8	15	22	77	69	1.42	.96
Feb	28.68	1.34	19.4	27.5	26.2	56	— 7	35.5	16.8	14	20	81	73	.59	.24
Mar	28.58	.90	33.7	49.2	44.1	73	18	56.5	31.7	29	38	84	68	2.25	2.04
Apr	28.55	.99	47.0	60.7	55.6	87	36	66.9	44.3	39	41	76	52	3.48	1.52
May	28.47	1.01	56.4	67.8	62.4	89	34	72.9	51.8	49	50	79	56	5.65	1.84
June	28.52	.74	64.4	75.5	70.5	91	50	81.2	59.8	58	59	82	57	2.46	1.06
July	28.51	.46	69.0	80.2	75.7	97	51	86.1	65.3	64	66	84	63	8.29	5.14
Aug	28.58	.44	66.4	77.5	74.0	95	53	84.4	63.8	62	65	87	67	4.90	1.18
Sept	28.54	.76	54.9	67.2	64.0	92	34	76.3	51.8	50	54	85	64	1.90	.74
Oct	28.64	.64	44.1	54.8	53.1	85	28	63.9	42.3	40	45	87	73	1.90	.72
Nov	28.67	.94	28.0	36.9	36.6	62	10	46.7	26.4	23	28	83	73	1.62	1.22
Dec	28.54	1.31	33.7	42.9	42.0	72	4	52.6	31.3	29	32	83	67	.01	.01
Year	28.57	.88	44.8	56.0	52.8	97	— 7	63.5	42.0	39	43	82	65	34.47	....

CORPUS CHRISTI, TEX.

[Lat., 27° 49′ N.; Long., 97° 25′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan	30.08	.74	52.1	57.2	55.1	73	34	61.0	49.2	48	50	88	80	5.47	1.43
Feb	30.12	.75	55.4	58.5	57.0	76	42	61.2	52.9	53	55	91	88	3.61	1.02
Mar	30.02	.60	58.0	63.8	61.3	81	45	67.1	55.5	54	56	88	78	3.24	1.50
Apr	29.98	.57	69.7	73.1	71.5	83	58	76.9	66.1	66	65	87	78	1.06	0.90
May	29.98	.52	72.8	76.0	73.9	84	56	78.5	69.3	68	68	85	78	4.21	2.68
June	29.94	.35	78.5	81.0	79.5	91	69	84.1	74.9	75	75	88	82	2.96	1.43
July	29.97	.30	81.0	84.3	82.2	91	74	87.6	76.9	76	76	86	77	0.50	0.26
Aug	29.98	.21	79.1	83.7	80.8	94	70	86.1	75.5	75	75	88	75	3.00	1.27
Sept	29.95	.48	73.6	79.2	75.9	88	56	81.5	70.3	69	71	87	78	12.69	3.72
Oct	30.06	.52	69.9	75.7	73.0	88	54	79.4	66.6	65	66	84	74	0.48	0.15
Nov	30.14	.77	55.3	63.3	60.1	82	40	67.6	52.6	50	55	84	75	3.91	1.91
Dec	30.14	.56	66.4	69.8	68.4	80	46	72.9	63.9	63	65	90	85	0.14	0.06
Year	30.03	.53	67.6	72.1	69.9	94	34	75.3	64.5	64	65	87	79	41.27	....

FORT CUSTER, MONT.

[Lat., 45° 42′ N.; Long., 107° 34′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan	26.88	.85	8.9	20.8	16.1	48	—12	27.8	4.4	6	14	87	77	0.20	0.07
Feb	26.92	1.02	15.7	25.8	21.4	54	—24	30.7	12.1	10	15	82	70	0.56	0.18
Mar	26.86	.95	29.5	49.1	40.6	70	12	54.1	27.0	24	27	81	47	0.25	0.25
Apr	26.83	.93	40.6	59.7	50.6	78	26	63.7	37.5	30	29	68	34	0.95	0.60
May	26.78	.95	44.6	61.1	52.6	85	29	64.5	40.7	37	37	76	44	1.59	0.98
June	26.82	.72	55.9	75.2	64.8	100	36	78.7	50.9	46	46	72	40	0.90	0.30
July	26.84	.69	58.5	79.8	69.8	95	41	84.3	55.4	50	48	74	36	0.76	0.49
Aug	26.82	.72	55.9	83.0	70.5	100	45	87.6	53.4	46	47	70	32	0.89	0.72
Sept	26.84	.72	44.0	64.6	55.4	86	30	69.6	41.2	37	42	78	47	0.51	0.23
Oct	26.89	.67	37.8	58.0	50.8	89	23	65.9	35.6	33	37	84	49	0.50	0.24
Nov	26.90	.89	23.5	36.0	32.8	64	6	45.6	19.9	20	27	87	73	0.12	0.07
Dec	26.72	.76	19.7	29.8	27.9	58	— 4	39.4	16.4	17	25	89	84	0.25	0.20
Year	26.84	.82	36.2	53.6	46.1	100	—24	59.3	32.9	30	33	79	53	7.48	....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

CONCORDIA, KANS.

[H=1,410. T=42. h=34.]

Month and year.	Mean cloudiness (in tenths.)	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan	2.2	7.0	28	S.	NW.	9	3	5	3	3	15	8	16	0	21	6	4	5	7	31	0	0	0
Feb	3.4	7.4	46	NW.	N.	11	4	7	4	6	9	7	8	0	11	11	6	6	11	24	0	0	0
Mar	2.8	7.0	34	NE.	N.	18	7	7	2	8	3	9	7	1	18	9	4	4	0	15	0	1	0
Apr	3.4	9.0	42	N.	N.	15	4	9	11	6	3	7	5	0	13	11	6	8	0	0	0	4	0
May	3.6	9.9	50	S.	S.	14	7	5	4	15	6	7	3	1	15	10	6	14	0	0	0	7	0
June	2.8	6.6	28	SE.	SE.†	6	0	0	17	17	4	8	8	0	13	16	1	10	0	0	1	5	0
July	4.7	7.2	32	S.	S.	8	8	6	14	15	4	3	4	0	6	21	4	9	0	0	8	8	0
Aug	4.0	7.6	28	S.	SE.	3	2	9	20	19	5	0	3	1	11	18	2	11	0	0	2	9	0
Sept	3.5	6.0	26	S.	S.	7	5	4	11	12	2	5	3	11	14	15	1	8	0	0	1	4	0
Oct	4.3	5.7	24	N.	SE.	11	8	7	16	11	0	2	3	4	17	5	9	6	0	2	0	1	0
Nov	3.9	6.3	28	NW.	S.	11	3	1	5	18	4	6	12	0	16	9	5	7	1	22	0	0	0
Dec	3.8	8.5	42	NW.	S.	8	6	2	6	16	8	8	8	0	19	7	5	1	1	17	0	0	0
Year	3.5	7.4	...	......	S.	121	57	62	113	146	63	70	80	18	174	138	53	89	20	111	12	39	0

CORPUS CHRISTI, TEX.

[H=20. T=43. h=35.]

Month and year.	Mean cloudiness (in tenths.)	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	6.5	10.6	36	NW.	NW.	8	5	13	12	1	2	1	18	2	5	13	13	12	0	0	0	1	0
Feb	7.8	10.3	30	N.	N.	18	6	11	16	3	1	1	0	0	2	8	18	15	0	0	0	0	0
Mar	4.8	11.9	37	W.	SE.	6	5	8	17	4	3	6	13	0	9	11	11	9	0	0	0	2	0
Apr	5.0	13.6	36	N.	SE.	7	1	7	34	4	1	4	2	0	9	14	7	6	0	0	0	6	0
May	5.7	14.4	47	NE.	SE.	5	4	1	45	3	0	1	2	1	8	10	13	6	0	0	0	4	0
June	6.1	12.5	30	SE.	SE.	1	1	2	52	1	1	0	2	0	0	20	10	9	0	0	1	5	0
July	4.7	12.6	25	SE.	SE.	0	1	2	43	15	0	0	0	1	9	17	5	2	0	0	1	1	0
Aug	5.9	11.2	32	E.	SE.	11	2	18	29	0	0	1	1	0	4	20	7	8	0	0	1	2	0
Sept	5.9	11.9	42	SE.	SE.	14	2	5	30	2	1	1	4	1	6	15	9	14	0	0	0	2	0
Oct	4.3	10.0	38	SE.	SE.	9	5	5	26	7	1	4	5	0	10	17	4	6	0	0	0	0	0
Nov	4.7	10.8	48	NW.	NW.	11	6	5	12	3	0	6	17	0	11	13	6	9	0	0	0	1	0
Dec	5.5	10.1	35	N.	SE.	6	0	5	39	8	0	0	3	1	0	23	8	5	0	0	0	0	0
Year	5.7	11.7	...	......	SE.	96	38	82	355	51	10	25	67	6	73	181	111	101	0	0	3	24	0

FORT CUSTER, MONT.

[H=3,040. T=18. h=26.]

Month and year.	Mean cloudiness (in tenths.)	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	5.0	5.6	32	NW.	SE.	6	1	1	26	5	10	4	8	1	12	10	9	7	19	31	0	0	0
Feb	5.6	8.0	66	NW.	SE.	10	4	4	13	7	9	2	7	0	7	8	13	10	11	24	0	0	0
Mar	4.2	6.5	36	NW.	NE.	9	13	4	12	3	8	4	8	1	12	8	11	2	2	24	0	1	0
Apr	5.5	8.8	42	E.†	SE.	6	7	7	16	1	12	5	6	0	5	14	11	9	0	4	0	0	0
May	6.0	8.4	48	W.	N.	10	9	8	9	5	7	4	9	1	10	10	11	11	0	2	0	2	0
June	4.7	7.5	39	W.	SE.	8	8	8	15	5	7	5	2	2	5	19	6	8	0	0	4	4	0
July	4.3	8.1	46	N.	N.	16	6	7	15	2	7	1	6	2	9	17	5	6	0	0	9	8	0
Aug	3.5	6.2	55	SW.	SE.	3	6	9	23	9	5	4	2	1	17	11	3	5	0	0	11	2	0
Sept	4.6	7.5	42	NW.	SE.	8	4	3	20	1	11	2	10	1	12	10	8	4	0	1	0	0	0
Oct	4.1	5.4	28	NW.	SE.	8	5	8	17	7	7	3	4	3	12	15	4	3	0	10	0	0	0
Nov	3.8	6.7	38	N.	SE.	4	2	4	22	4	14	2	6	2	14	10	6	5	4	29	0	0	0
Dec	4.3	5.5	26	SE.	SE.	6	7	4	26	2	6	6	4	1	10	15	6	5	6	30	0	0	0
Year	4.6	7.0	...	......	SE.	94	72	67	214	51	103	42	72	15	125	147	93	75	42	155	24	17	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

DAVENPORT, IOWA.

[Lat., 41° 30′ N.; Long., 90° 38′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan	29.36	1.19	22.2	28.2	26.4	55	—1	33.6	19.2	18	21	82	76	0.95	0.36
Feb	29.48	1.38	15.1	23.1	20.0	48	—12	28.1	11.9	10	16	80	73	1.44	0.52
Mar	29.36	0.71	33.9	44.7	41.0	69	23	50.4	31.7	28	30	80	60	1.74	1.39
Apr	29.38	.97	44.2	55.2	50.8	76	25	60.5	41.0	36	38	75	55	3.89	2.21
May	29.30	.61	55.2	63.5	60.0	86	37	68.7	51.3	46	48	74	61	6.34	2.72
June	29.32	.78	62.3	71.1	67.0	89	39	76.3	57.6	57	58	81	65	5.59	2.04
July	29.32	.55	68.5	77.0	73.8	92	55	82.8	64.9	62	64	81	64	8.25	5.18
Aug	29.42	.49	65.3	76.1	72.1	92	54	82.7	61.5	58	61	79	60	1.11	0.58
Sept	29.38	.68	56.3	64.5	62.8	86	33	72.3	53.4	51	53	83	66	3.27	1.45
Oct	29.50	.82	41.5	50.9	49.0	81	27	58.5	39.5	35	37	79	62	1.26	0.62
Nov	29.46	.98	31.8	38.0	36.6	58	5	43.5	29.7	27	29	83	71	2.17	0.94
Dec	29.41	1.03	35.9	41.4	39.6	65	10	46.9	32.4	30	34	81	76	1.60	0.73
Year	29.39	.85	44.4	52.8	49.9	92	—12	58.7	41.2	38	41	80	66	37.61	....

DENVER, COLO.

[Lat., 39° 45′ N.; Long., 105° W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan	24.71	0.84	16.4	31.2	27.2	56	4	40.2	14.0	9	16	76	56	0.50	0.20
Feb	24.73	.84	22.4	34.9	29.6	61	—7	42.0	17.3	13	12	71	42	0.70	0.49
Mar	24.76	.84	32.1	51.2	43.3	70	18	56.3	30.3	21	19	66	32	0.40	0.34
Apr	24.76	.75	41.7	58.0	51.1	78	29	62.5	39.7	28	25	62	37	1.34	0.57
May	24.72	.90	46.6	61.5	55.5	83	32	67.0	44.0	36	32	69	42	3.44	2.08
June	24.80	.48	54.6	70.2	64.3	92	37	77.3	51.3	43	39	66	39	1.88	0.99
July	24.82	.41	61.2	79.9	72.0	100	50	85.9	58.2	48	46	64	35	2.94	1.18
Aug	24.84	.45	59.4	79.1	72.8	98	46	87.7	57.8	47	44	65	34	0.33	0.25
Sept	24.82	.65	47.1	68.0	60.0	94	30	74.9	45.0	32	32	58	31	0.28	0.15
Oct	24.84	.66	39.8	58.1	51.8	85	25	65.4	38.1	28	30	65	41	2.11	0.91
Nov	24.84	.69	25.7	34.0	32.4	60	3	43.5	21.4	16	22	72	65	0.53	0.21
Dec	24.69	.73	33.4	42.5	40.5	66	4	52.5	28.5	22	23	64	48	0.30	0.22
Year	24.78	.60	40.0	55.7	50.0	100	—7	62.9	37.1	29	28	66	42	14.75	....

DES MOINES, IOWA.

[Lat., 41° 35′ N.; Long., 93° 37′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan	29.12	1.12	17.5	26.0	23.0	50	—1	31.4	14.5	12	19	77	76	1.22	1.08
Feb	29.24	1.55	15.2	24.0	21.0	52	—13	31.1	11.0	6	15	68	68	.27	.10
Mar	29.12	0.79	31.5	46.9	42.2	69	16	54.5	29.8	26	28	82	51	.11	.07
Apr	29.09	.94	43.7	57.0	51.8	82	24	63.1	40.4	35	38	74	52	2.66	.82
May	29.01	.88	54.8	66.2	60.9	85	34	71.3	50.5	46	44	73	48	4.84	2.50
June	29.05	.76	61.9	72.8	67.8	88	37	78.6	57.1	54	56	77	57	4.39	1.71
July	29.04	.46	67.8	77.3	73.8	91	51	83.7	64.0	62	63	83	63	4.37	1.60
Aug	29.13	.41	63.9	76.5	72.1	93	47	83.4	60.8	58	60	81	57	2.25	2.20
Sept	29.08	.70	54.7	64.5	62.8	86	31	73.6	52.1	50	50	85	63	3.41	1.48
Oct	29.22	.77	40.2	52.2	49.2	85	26	59.7	38.6	34	38	80	60	.52	.28
Nov	29.19	.99	27.4	37.6	34.8	63	4	44.2	25.3	21	25	78	63	1.29	1.07
Dec	29.10	1.21	33.8	41.1	39.6	69	8	48.2	30.9	28	31	81	70	.57	.27
Year	29.12	0.88	42.7	53.5	49.9	93	—13	60.2	39.6	36	39	78	61	25.90	....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

DAVENPORT, IOWA.

[H=615. T=72. h=64.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
1889.																							
Jan	4.4	8.2	40	SW.	NW.	6	4	4	5	5	12	12	14	0	15	3	13	7	13	30	0	0	0
Feb	4.6	8.9	35	SW.	NW.	2	2	10	2	3	5	9	21	2	11	6	11	10	15	28	0	0	0
Mar	4.5	7.3	34	S.	NW.	6	11	3	5	1	5	3	19	9	13	8	10	6	1	14	0	2	0
Apr	4.2	9.3	35	SW.	NE.	4	13	7	3	5	6	5	11	6	8	13	9	7	0	3	0	4	0
May	4.8	9.4	36	SW.†	SW.	9	12	4	3	10	13	1	9	1	9	14	8	16	0	0	0	6	0
June	3.6	6.4	28	NE.	SW.	1	4	6	9	6	13	2	13	6	9	14	7	8	0	0	0	4	0
July	4.7	5.8	36	NW.	E.	2	6	12	10	7	7	6	8	4	10	15	6	13	0	0	2	13	0
Aug	3.2	4.6	29	S.	SW.	3	1	5	7	10	10	2	6	18	20	7	4	6	0	0	3	5	0
Sept	5.2	6.9	26	SW.	NW.	2	7	4	6	10	10	6	13	2	8	12	10	12	0	0	0	2	0
Oct	3.7	6.2	30	NW.	NE.	7	13	6	4	3	5	2	11	11	19	5	7	6	0	4	0	1	0
Nov	4.7	7.6	28	NW.	NW.	8	11	5	0	3	9	6	17	1	12	8	10	9	2	16	0	0	0
Dec	5.5	7.3	36	NW.	SW.	0	4	4	5	4	14	6	8	17	10	9	12	15	1	15	0	1	0
Year	4.4	7.3	..	......	NW.	50	88	70	59	67	109	60	150	77	144	114	107	115	32	110	5	38	0

DENVER, COLO.

[H=5,281. T=86. h=79.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
Jan	3.2	6.4	36	N.	S.	7	3	6	3	29	8	1	3	2	14	11	6	8	8	31	0	0	0
Feb	4.3	7.0	36	NW.†	S.	6	5	8	4	18	5	2	5	3	4	19	5	6	6	26	0	0	0
Mar	4.6	6.7	36	N.	S.	11	10	6	5	16	7	1	5	1	3	25	3	4	0	20	0	0	0
Apr	5.8	8.0	48	NW.†	S.	12	5	7	2	17	4	2	11	0	4	16	10	10	1	3	0	1	0
May	6.6	6.2	45	NW.	S.†	11	6	1	6	11	4	4	8	11	1	18	12	12	0	0	0	4	0
June	4.6	5.3	34	N.	S.	11	2	2	5	19	5	5	4	7	5	22	3	12	0	0	1	7	0
July	4.7	6.1	32	SW.	S.	4	8	4	2	27	3	5	4	5	6	19	6	10	0	0	11	4	0
Aug	5.3	6.1	42	SW.	S.	7	2	5	4	23	11	4	6	0	6	21	4	6	0	0	10	6	0
Sept	3.9	6.4	36	NW.	S.	11	4	7	5	21	4	2	6	0	9	18	3	6	0	1	3	1	0
Oct	4.6	6.0	36	NW.	S.	10	5	5	2	25	5	3	7	0	9	16	6	7	0	3	0	0	0
Nov	4.1	6.8	34	NE.	S.	6	4	1	3	29	3	5	8	1	13	11	6	6	5	27	0	0	0
Dec	4.8	6.3	38	NW.	S.	6	3	1	2	20	12	9	6	3	8	18	5	3	1	18	0	0	0
Year	4.7	6.4	..	......	S.	102	57	53	43	255	71	43	73	33	82	214	69	90	21	129	25	23	0

DES MOINES, IOWA.

[H=869. T=84. h=75.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
Jan	4.2	7.4	30	NW.	NW.	5	2	7	4	4	3	10	19	8	14	5	12	5	16	31	0	0	0
Feb	4.9	8.6	36	N.	NW.	11	1	6	4	7	5	3	19	0	9	9	10	6	12	27	0	0	0
Mar	4.1	7.1	29	N.	N.	15	9	3	8	3	4	6	12	2	14	9	8	2	0	19	0	0	0
Apr	5.1	10.2	36	W.†	SE.	5	8	9	14	4	2	9	9	0	13	7	10	10	0	3	0	2	0
May	5.0	9.8	46	N.	N.	16	9	4	3	8	7	8	6	1	10	8	13	11	0	0	0	9	0
June	3.6	7.1	36	SW.	SE.	9	6	5	13	8	9	3	6	1	18	8	4	6	0	0	0	4	0
July	4.5	7.0	28	SE.	SE.	8	4	4	13	8	9	7	8	1	15	9	7	11	0	0	3	7	0
Aug	3.2	6.6	24	SW.	SW.	6	1	2	11	9	13	5	7	8	20	7	4	4	0	0	3	3	0
Sept	4.2	7.8	32	SW.	NW.	2	1	6	11	4	10	8	14	4	15	6	9	11	0	1	0	3	0
Oct	3.4	6.3	25	NW.	N.	11	4	10	11	6	3	3	3	11	18	6	7	6	0	5	0	1	0
Nov	3.5	7.0	36	NE.	NW.	4	5	3	8	1	6	3	21	9	21	3	6	4	3	22	0	0	0
Dec	5.3	8.2	36	NW.	NW.	2	4	2	10	11	13	1	15	4	12	8	11	8	2	16	0	1	0
Year	4.2	7.8	..	......	NW.	94	54	61	110	73	84	66	139	49	179	85	101	84	33	124	6	30	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

DETROIT, MICH.

[Lat., 42° 20′ N.; Long., 83° 03′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a.m.	Temperature. 8 p.m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a.m.	Dew-point. 8 p.m.	Relative humidity. 8 a.m.	Relative humidity. 8 p.m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	29.28	1.53	27.4	30.2	29.8	49	7	35.3	24.3	23	24	84	81	1.51	0.39
Feb ..	29.38	1.31	16.2	21.7	19.4	49	— 8	26.2	12.5	12	16	85	78	0.76	.24
Mar ..	29.27	.86	32.8	37.3	37.4	65	17	45.0	29.9	26	27	77	68	1.17	.83
Apr ..	29.30	1.06	42.9	46.3	46.3	76	22	54.8	37.8	34	35	71	66	1.14	.46
May .	29.24	.59	54.2	58.6	57.3	88	34	66.4	48.2	44	44	69	61	4.41	2.57
June .	29.28	.76	60.3	64.7	63.8	86	42	72.3	55.2	54	56	82	75	3.28	1.24
July .	29.28	.57	68.1	72.8	71.2	91	53	80.3	62.3	59	60	74	66	1.54	.62
Aug ..	29.38	.53	65.1	71.0	69.9	90	52	80.0	59.8	56	55	72	57	0.19	.10
Sept .	29.32	.82	57.6	63.5	62.7	85	36	72.0	53.4	52	51	82	65	0.56	.37
Oct ..	29.40	.92	42.4	47.0	46.9	76	25	54.4	39.4	36	36	77	66	1.05	.61
Nov ..	29.32	1.22	37.8	40.0	40.2	64	16	45.2	35.3	34	34	85	79	2.36	.80
Dec ..	29.36	1.05	35.9	38.3	39.2	65	19	45.8	32.5	31	32	84	76	3.09	.88
Year .	29.32	.94	45.1	49.3	48.7	91	— 8	56.5	40.9	38	39	78	70	21.06	.....

DODGE CITY, KANS.

[Lat., 37° 45′ N.; Long., 100° 0′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a.m.	Temperature. 8 p.m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a.m.	Dew-point. 8 p.m.	Relative humidity. 8 a.m.	Relative humidity. 8 p.m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	27.42	.85	19.4	31.2	28.9	58	11	40.7	17.1	14	22	81	70	1.69	1.26
Feb ..	27.49	1.24	20.4	31.3	29.0	60	— 8	40.1	18.0	14	20	78	65	0.34	0.28
Mar ..	27.41	.93	34.8	49.8	45.8	78	21	58.8	32.7	28	33	76	55	1.38	0.48
Apr ..	27.40	.92	47.7	63.2	56.6	88	35	69.2	44.1	40	42	77	50	2.12	1.38
May .	27.32	1.09	56.1	69.6	63.7	94	38	75.9	51.5	48	45	73	47	1.54	0.78
June .	27.38	.76	63.4	76.0	69.8	93	48	81.4	58.2	57	56	81	51	3.43	1.68
July .	27.37	.48	69.8	82.2	77.5	105	53	90.2	64.8	63	62	80	55	2.02	0.69
Aug ..	27.42	.45	68.3	82.0	76.9	97	55	89.3	64.5	61	59	79	48	2.14	0.87
Sept .	27.40	.78	56.0	70.4	66.3	95	32	79.7	52.9	50	48	80	46	0.86	0.45
Oct ..	27.46	.68	47.1	58.0	55.6	94	28	66.7	44.5	41	42	81	62	2.88	1.29
Nov ..	27.50	.94	29.5	38.0	37.4	66	16	48.1	26.8	24	26	80	64	0.77	0.24
Dec ..	27.38	.92	35.6	45.3	44.6	72	10	56.9	32.3	27	28	74	53	0.00	0.00
Year .	27.41	.84	45.7	58.1	54.3	105	— 8	66.4	42.3	39	40	78	56	19.17	.....

DUBUQUE, IOWA.

[Lat., 42° 30′ N.; Long., 90° 44′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a.m.	Temperature. 8 p.m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a.m.	Dew-point. 8 p.m.	Relative humidity. 8 a.m.	Relative humidity. 8 p.m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.31	1.27	18.5	25.3	23.6	52	— 4	31.5	15.8	14	20	83	81	1.55	.54
Feb ..	29.43	1.49	11.6	20.3	17.4	45	—16	25.2	9.5	7	14	81	78	1.34	.82
Mar ..	29.32	.68	33.7	44.7	41.0	70	23	50.3	31.6	28	35	82	70	.30	.14
Apr ..	29.30	.88	43.4	55.1	50.0	78	25	60.4	39.7	37	45	79	71	3.56	2.10
May .	29.24	.64	54.3	63.0	59.4	85	36	69.2	49.7	48	54	81	73	4.00	1.05
June .	29.27	.77	61.7	70.9	66.2	88	42	76.0	56.4	56	60	82	70	3.87	2.23
July .	29.28	.57	68.0	76.4	73.0	95	50	82.8	63.3	62	66	82	72	4.22	2.30
Aug ..	29.36	.49	65.2	75.4	71.6	94	50	82.5	60.6	59	63	79	65	.26	.12
Sept .	29.31	.69	55.9	64.7	62.6	90	31	72.5	52.8	52	58	87	79	1.54	.44
Oct ..	29.46	.83	39.3	49.8	47.6	79	22	58.3	37.0	35	44	86	80	.66	.50
Nov ..	29.40	1.00	30.0	36.1	34.8	60	8	41.9	27.6	26	31	86	84	1.57	.59
Dec ..	29.33	1.09	33.7	39.2	37.4	67	10	44.6	30.3	30	34	86	83	1.38	.63
Year .	29.33	.87	42.9	51.7	48.7	95	—16	57.9	39.5	38	44	83	76	24.25	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

Month and year.	Mean cloudiness (in tenths).	Wind.													Number of days.								
		Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
DETROIT, MICH. [$H=662$. $T=81$. $h=72$.]																							
1889.																							
Jan	6.6	10.9	47	SW.	SW.	5	4	4	5	6	20	11	7	0	5	8	18	13	11	27	0	0	0
Feb	6.2	10.9	33	S.	W.	6	4	5	2	10	7	15	7	0	2	9	17	11	17	28	0	0	0
Mar	5.8	9.8	29	NW.	NW.	11	11	6	2	2	6	10	14	0	7	13	11	6	0	17	0	0	0
Apr	6.0	9.5	34	SW.	NW.	6	9	5	4	6	9	6	15	0	9	7	14	8	0	6	0	2	0
May	5.5	10.3	34	S.	SW.	3	12	3	6	7	14	4	12	1	7	10	14	9	0	0	0	3	0
June	6.4	8.4	30	SW.	SW.	1	11	8	4	10	15	4	7	0	1	15	14	10	0	0	0	3	0
July	3.8	7.2	31	SW.	SW.	3	11	7	5	11	10	6	7	2	12	13	6	6	0	0	2	1	0
Aug	3.7	7.6	25	NW.	SW.	3	8	1	4	15	13	7	9	2	15	12	4	4	0	0	0	0	0
Sept	4.8	8.9	40	SW.	SW.	3	6	3	13	6	9	8	8	4	10	9	11	5	0	0	0	1	0
Oct	6.2	10.0	34	NW.	NW.	5	12	4	3	3	10	3	22	0	8	10	13	5	0	3	0	1	0
Nov	7.2	10.0	34	E.	SW.	4	8	1	2	5	21	11	7	1	5	6	19	13	3	10	0	0	0
Dec	6.6	10.9	45	SW.	SW.	3	5	6	4	7	20	12	4	1	6	9	16	13	1	12	0	1	0
Year	5.7	9.5	..	.....	SW.	53	101	53	54	88	154	97	119	11	87	121	157	103	32	103	2	12	0
DODGE CITY, KANS. [$H=2,523$. $T=44$. $h=37$.]																							
Jan	2.7	9.8	42	NW.	W.	9	12	6	2	3	9	14	7	0	16	11	4	4	7	31	0	0	0
Feb	4.9	9.5	58	N.	NE.	5	13	9	7	5	4	7	5	1	8	10	10	5	8	26	0	0	0
Mar	4.4	10.1	42	N.†	NE.	12	14	6	10	4	2	4	8	2	8	16	7	5	0	11	0	2	0
Apr	4.7	11.2	48	NW.	SE.	10	4	0	18	7	3	3	15	0	9	15	6	8	0	0	0	3	0
May	4.8	14.2	54	S.	N.	19	4	0	13	12	6	5	3	0	7	17	7	12	0	0	1	8	0
June	5.2	11.4	48	SE.	S.	10	3	2	16	19	1	4	4	1	6	13	11	14	0	0	4	10	0
July	4.6	12.2	44	SE.	S.	10	2	4	11	27	2	2	4	0	11	11	9	14	0	0	16	4	0
Aug	4.7	14.6	44	NE.	S.	3	6	5	19	25	1	0	1	2	11	17	3	7	0	0	15	7	0
Sept	3.9	11.5	46	S.	S.	9	3	0	18	19	2	4	5	0	12	16	2	3	0	0	3	1	0
Oct	5.2	9.7	33	E.	N.	16	6	5	12	11	0	0	4	8	12	7	12	8	0	1	1	0	0
Nov	4.3	8.1	48	N.	N.	17	1	2	0	11	3	3	13	10	15	7	8	7	2	26	0	0	0
Dec	3.9	11.0	60	S.	S.	8	5	0	7	12	6	5	7	12	18	9	4	0	1	13	0	0	0
Year	4.4	11.1	..	.....	S.	128	73	39	133	155	39	51	76	36	133	149	83	87	18	108	40	35	0
DUBUQUE, IOWA. [$H=651$. $T=60$. $h=50$.]																							
Jan	4.4	4.1	26	SW.	NW.	7	0	4	4	7	8	10	11	11	15	4	12	7	15	30	0	0	0
Feb	5.0	3.5	24	N.	NW.	4	0	3	7	6	1	13	17	5	10	9	9	8	18	28	0	0	0
Mar	4.3	4.8	24	NW.†	N.	14	9	1	3	6	4	13	10	2	10	14	7	3	1	14	0	0	0
Apr	4.5	5.9	28	SW.	S.	11	6	10	2	12	4	3	11	1	10	11	9	9	0	3	0	2	0
May	5.6	5.7	23	S.	S.	11	5	7	1	22	4	1	10	1	4	14	13	12	0	0	0	5	0
June	4.8	4.3	24	W.	S.	7	1	6	10	10	6	8	10	2	9	10	11	8	0	0	0	3	0
July	5.1	3.9	30	W.	S.	5	3	7	12	13	8	4	7	3	8	13	10	12	0	0	3	6	0
Aug	4.0	3.0	20	W.	SE.	3	0	5	10	7	4	9	3	21	17	7	7	5	0	0	3	0	0
Sept	5.9	4.8	26	W.	NW.	2	1	3	10	11	8	5	14	6	9	7	14	12	0	1	0	0	0
Oct	4.0	4.4	22	NW.	N.	15	4	3	6	5	2	2	9	16	15	7	9	4	0	11	0	1	0
Nov	5.0	5.2	23	W.	NW.	8	6	3	4	3	6	6	14	10	13	7	10	7	2	20	0	0	0
Dec	6.3	5.3	26	W.	SE.	7	0	2	14	9	3	11	8	8	5	13	13	13	2	18	0	1	0
Year	4.9	4.6	..	.....	NW.	94	35	54	83	111	58	85	124	86	125	116	124	100	38	125	6	18	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

FORT DU CHESNE, UTAH.

[Lat., 40° 35′ N.; Long., 109° 50′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	25.11	.88	—7.5	7.9	6.8	38	—21	21.2	—7.7	—12	0	78	71	.39	.28
Feb ..	25.12	.97	1.5	19.8	15.4	45	—15	29.9	0.8	— 5	10	74	65	.18	.09
Mar ..	25.04	.76	27.5	49.8	42.5	71	17	58.4	26.6	16	22	64	36	.32	.23
Apr ..	25.00	.63	38.2	62.1	52.6	84	24	68.8	36.3	25	27	60	30	.68	.28
May .	24.96	.74	44.9	66.6	57.0	89	30	72.9	41.2	28	28	53	27	.73	.42
June	25.02	.44	54.1	78.9	67.6	96	37	86.1	49.2	37	31	53	19	.15	.15
July .	25.04	.46	58.5	85.2	73.2	103	44	93.1	53.4	38	42	47	26	.69	.35
Aug ..	25.08	.41	56.6	82.6	72.2	100	41	90.7	53.6	39	44	53	28	.53	.34
Sept .	25.08	.60	41.8	70.4	59.3	90	28	78.4	40.2	28	28	60	24	.36	.36
Oct ..	25.13	.53	33.8	58.0	48.8	85	22	64.1	33.6	27	32	77	43	.75	.31
Nov ..	25.18	.63	16.6	33.5	29.9	55	6	43.5	16.3	13	24	84	70	.08	.08
Dec .*	25.03	.66	27.3	33.3	33.2	50	4	40.1	26.3	23	27	85	80	2.01	.40
Year .	25.07	.64	32.8	54.0	46.5	103	—21	62.3	30.8	21	26	66	43	6.87	.....

DULUTH, MINN.

[Lat., 46° 48′ N.; Long., 92° 8′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.25	1.54	15.1	22.6	19.6	45	—13	26.3	13.0	12	17	87	80	1.34	.56
Feb ..	29.37	1.40	2.0	12.6	8.8	53	—30	18.5	—0.9	0	8	90	82	1.38	.53
Mar ..	29.30	.65	28.9	35.2	33.1	64	1	40.6	25.6	23	27	79	74	1.67	.65
Apr ..	29.28	.91	37.7	42.6	40.8	70	22	48.0	33.5	31	32	77	69	3.35	1.99
May .	29.22	1.01	46.3	51.5	48.8	78	32	57.7	40.0	36	36	70	59	2.05	.79
June .	29.23	.72	54.8	60.7	57.5	80	43	65.5	49.5	46	46	74	61	1.85	.67
July .	29.20	.58	61.7	66.4	64.0	84	50	71.7	56.4	55	54	79	67	5.53	1.95
Aug ..	29.26	.66	61.5	67.0	64.8	86	48	72.1	57.4	54	55	79	68	7.87	2.76
Sept .	29.19	.75	51.3	55.4	54.8	76	36	61.8	47.7	44	45	78	70	4.02	2.94
Oct ..	29.43	.80	38.6	43.9	42.3	70	25	48.4	36.2	31	34	77	70	.34	.28
Nov ..	29.34	1.02	27.3	32.6	31.0	60	1	37.1	24.8	21	22	79	66	.87	.35
Dec ..	29.25	1.05	23.1	28.2	25.6	43	— 6	31.4	19.8	18	22	82	78	1.77	.50
Year .	29.28	.92	37.4	43.2	40.9	86	—30	48.3	33.6	31	33	79	70	32.04	.....

EASTPORT, ME.

[Lat., 44° 54′ N.; Long., 66° 59′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.92	1.58	25.8	28.1	28.0	48	— 2	34.9	21.1	18	20	74	72	3.44	1.24
Feb ..	29.96	1.49	18.9	21.9	20.0	45	—12	26.2	13.7	12	15	74	74	4.13	.84
Mar ..	29.78	1.53	31.1	34.4	33.0	54	15	38.6	27.5	24	28	77	78	4.06	1.08
Apr ..	29.91	1.18	40.2	41.1	41.4	63	26	47.5	35.3	33	34	78	78	3.19	1.20
May .	29.88	.89	48.8	47.4	49.4	70	37	56.6	42.2	43	43	81	85	2.20	1.06
June .	29.92	.93	56.1	54.5	56.9	81	44	64.7	49.1	52	50	87	85	2.85	1.33
July .	29.89	.72	59.9	59.7	60.7	76	50	67.4	54.0	53	54	81	84	3.69	.90
Aug ..	29.96	.61	59.9	58.8	60.3	76	50	66.3	54.3	55	54	85	86	2.00	.51
Sept .	29.98	1.05	56.8	56.8	58.0	83	37	64.1	51.8	51	52	82	84	2.52	1.52
Oct ..	29.96	.91	44.9	46.2	45.8	58	29	50.1	41.5	37	39	76	78	5.02	1.50
Nov ..	29.94	1.28	39.4	40.6	39.8	57	19	44.8	34.9	31	33	74	75	4.60	1.56
Dec ..	29.99	2.11	26.7	29.8	28.4	49	1	35.2	21.6	18	21	71	71	4.56	1.06
Year .	29.92	1.19	42.4	43.3	43.5	83	—12	49.7	37.2	36	37	78	79	42.26	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

FORT DU CHESNE, UTAH.

[H=4,900. T=12. h=4.]

Month and year.	Mean cloudiness (in tenths).	Wind.													Number of days.								
		Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	3.1	1.4	17	NE.	NW.	7	1	0	1	5	1	7	21	19	16	8	7	3	27	31	0	0	0
Feb ..	2.9	2.0	27	W.	S.	7	1	0	4	15	4	3	2	20	12	13	3	2	18	28	0	0	0
Mar ..	2.6	3.8	28	W.	S.	4	1	6	8	17	5	6	3	12	16	11	4	3	0	25	0	0	0
Apr ..	3.8	4.6	35	W.	S.	0	10	0	10	13	7	8	3	9	8	16	6	4	0	5	0	0	0
May .	4.0	7.2	50	W.	S.	2	9	1	11	16	4	9	6	4	9	15	7	5	0	1	0	0	0
June .	2.5	5.6	43	NW.	S.	3	6	5	9	13	4	8	8	4	16	12	2	2	0	0	11	0	0
July .	4.8	5.2	37	NW.	SE.	7	5	7	16	7	7	9	3	1	13	11	7	3	0	0	22	2	0
Aug ..	5.2	5.4	44	W.	NW.	8	7	1	12	8	6	4	16	0	10	9	12	7	0	0	19	2	0
Sept .	3.7	5.1	39	W.	W.	10	6	6	11	2	4	11	8	2	17	10	3	2	0	6	1	0	0
Oct ..	5.7	2.6	36	W.	N.	13	7	4	7	8	1	6	3	13	7	14	10	5	0	12	0	0	0
Nov ..	3.8	2.4	35	W.	N.	15	4	1	10	5	2	6	12	5	16	11	3	1	0	30	0	0	0
Dec ..	7.7	2.1	24	W.	NW.	6	1	0	7	7	6	7	15	13	1	9	21	13	4	28	0	0	0
Year .	4.2	4.0	..	.....	S.	82	58	31	106	116	51	84	100	102	141	139	85	50	49	166	53	4	0

DULUTH, MINN.

[H=670. T=70. h=56.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	5.0	6.4	34	NW.†	NW.	2	7	0	3	2	18	2	25	3	5	14	12	13	19	31	0	0	0
Feb ..	4.6	8.0	37	NE.	NW.	0	6	2	0	2	17	8	18	3	9	9	10	7	25	28	0	0	0
Mar ..	5.8	7.9	30	SW.†	NW.†	2	18	0	1	0	18	3	18	2	8	10	13	7	4	25	0	0	3
Apr ..	5.6	7.9	34	NW.	NE.	2	27	2	2	2	3	3	16	3	6	12	12	9	0	7	0	0	2
May .	5.0	6.8	30	NE.	NE.	4	30	1	7	1	5	2	9	3	5	14	12	10	0	0	0	4	2
June .	4.9	5.8	23	NE.	NE.	0	31	2	2	0	6	2	10	7	6	13	11	7	0	0	0	4	0
July .	5.6	6.3	30	NW.	NE.	1	27	1	5	1	4	5	16	2	4	19	8	11	0	0	0	6	0
Aug ..	4.4	6.1	27	NE.	NE.	2	19	1	0	1	9	8	11	11	13	10	8	11	0	0	0	8	0
Sept .	6.2	7.7	29	W.	SW.	1	15	1	1	0	16	9	12	5	7	9	14	12	0	0	0	0	0
Oct ..	5.4	6.3	28	NW.	NE.	7	15	1	3	4	12	1	12	7	9	13	9	6	0	8	0	0	0
Nov ..	5.8	7.5	34	NE.	SW.	3	8	1	3	0	25	7	12	1	8	9	13	11	6	23	0	0	0
Dec ..	6.6	8.0	39	NW.	SW.	1	11	5	4	2	20	7	7	5	5	11	15	15	15	28	0	0	0
Year .	5.4	7.1	..	.....	NE.	25	214	17	31	15	153	57	166	52	85	143	137	119	69	150	0	22	7

EASTPORT, ME.

[H=53. T=51. h=43.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	4.0	13.1	63	SE.	NW.	3	9	3	4	2	8	9	23	1	12	6	13	11	10	25	0	0	0
Feb ..	4.4	12.8	48	E.	NW.	2	14	2	5	2	6	9	15	1	11	6	11	12	19	27	0	0	1
Mar ..	5.3	12.1	48	E.	NE.	6	17	8	2	2	9	4	11	3	6	8	17	11	4	23	0	1	0
Apr ..	5.5	9.2	36	NE.	NE.	4	16	4	0	4	11	2	11	8	9	3	18	12	0	7	0	0	1
May .	3.5	7.0	28	SW.†	SW.	4	2	4	3	4	26	5	5	9	9	12	10	9	0	0	0	2	1
June .	2.8	6.2	24	W.	SW.	6	4	2	0	6	30	4	0	8	7	12	11	15	0	0	0	1	0
July .	6.7	7.7	39	E.	SW.	8	7	1	3	1	22	5	8	7	6	8	17	13	0	0	0	1	0
Aug ..	5.1	6.1	40	E.	SW.	4	5	2	2	2	22	12	6	7	10	10	11	11	0	0	0	1	0
Sept .	4.7	7.5	46	S.	SW.	2	5	1	3	7	18	3	12	9	12	9	9	9	0	0	0	0	1
Oct ..	6.6	12.2	48	SE.	NE.	6	18	5	5	0	12	7	9	0	7	7	17	13	0	1	0	1	2
Nov ..	5.8	11.0	60	E.	W.	7	4	5	3	2	8	16	15	0	8	10	12	12	2	8	0	0	2
Dec ..	5.7	13.1	39	NW.	NW.	4	7	2	6	3	7	12	21	0	11	6	14	14	11	22	0	0	0
Year .	5.0	9.8	..	.....	SW.	56	108	39	36	35	179	88	136	53	108	97	160	142	46	113	0	7	8

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

FORT ELLIOTT, TEX.

[Lat., 35° 30′ N.; Long., 100° 21′ W.]

Month and year.	Pressure.		Temperature.							Dew-point.		Relative humidity.		Precipitation.	
								Mean.							
	Mean.	Range.	8 a.m.	8 p.m.	Mean (max. and min.).	Maximum.	Minimum.	Maximum.	Minimum.	8 a.m.	8 p.m.	8 a.m.	8 p.m.	Total.	Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	27.27	.80	26.9	35.0	33.7	60	15	44.4	23.0	21	23	78	64	1.63	1.48
Feb ..	27.33	1.06	25.8	38.4	35.2	75	1	48.5	21.8	17	22	73	54	.89	.63
Mar ..	27.24	.96	38.4	52.8	48.1	80	21	60.0	36.2	31	34	78	52	1.28	.55
Apr ..	27.24	.76	50.8	65.0	59.2	88	35	71.3	47.2	41	41	70	46	4.86	2.78
May .	27.20	.90	57.7	71.9	65.8	98	35	79.1	52.5	48	47	70	45	.72	.31
June .	27.25	.62	64.0	76.0	71.4	96	49	83.1	59.8	58	56	81	54	1.64	.66
July .	27.25	.45	70.0	85.1	79.4	108	52	92.0	66.8	65	67	85	57	.88	.32
Aug ..	27.30	.35	67.6	84.3	78.0	100	60	90.2	65.7	64	66	89	55	1.83	1.62
Sept .	27.28	.74	57.9	71.2	67.8	92	41	80.1	55.5	54	55	89	60	1.94	1.74
Oct ..	27.32	.72	49.9	61.5	58.4	94	35	69.8	47.0	46	47	88	65	2.99	1.18
Nov ..	27.38	.88	31.3	41.2	40.0	81	17	51.0	29.1	27	34	88	79	.74	.64
Dec ..	27.30	.76	42.9	51.8	51.9	81	13	65.2	38.6	38	40	82	67	.00	.00
Year .	27.28	.76	48.6	61.2	57.4	108	1	69.6	45.3	42	44	81	58	19.40	....

EL PASO, TEX.

[Lat., 31° 47′ N.; Long., 106° 30′ W.]

Jan ..	26.21	.72	32.6	47.3	41.5	67	20	52.4	30.6	23	24	69	42	.76	.40
Feb ..	26.24	.66	36.9	57.4	47.8	72	18	62.2	33.4	20	17	51	23	.18	.18
Mar ..	26.20	.45	43.9	62.6	53.9	85	29	66.8	41.0	28	24	58	28	.67	.44
Apr ..	26.16	.49	54.4	78.5	67.0	93	40	82.0	52.0	31	23	45	14	.04	.04
May .	26.14	.46	61.5	84.6	73.5	97	45	88.5	58.5	27	22	29	12	.00	.00
June .	26.16	.34	69.7	90.2	80.8	104	54	94.3	67.3	41	36	41	18	.28	.28
July .	26.19	.36	72.4	90.8	83.0	104	65	96.2	69.8	58	50	61	26	1.59	1.02
Aug ..	26.22	.33	71.9	91.2	82.7	103	63	95.6	69.8	52	45	51	22	.04	.04
Sept .	26.20	.55	62.9	77.7	71.4	100	42	82.7	60.2	50	47	64	39	2.64	.70
Oct ..	26.26	.52	53.8	72.7	65.0	89	39	78.9	51.2	40	36	62	28	.35	.28
Nov ..	26.30	.56	38.2	56.7	49.0	76	26	63.4	34.6	23	23	58	30	.55	.54
Dec ..	26.26	.63	41.4	61.3	53.2	76	19	68.5	37.8	26	27	54	28	.00	.00
Year .	26.21	.51	53.3	72.6	64.1	104	18	77.6	50.5	35	31	54	26	7.10	....

ERIE, PA.

[Lat., 42° 7′ N.; Long., 80° 5′ W.]

Jan ..	29.23	1.37	30.1	32.0	32.2	53	12	37.8	26.7	21	26	79	78	2.71	1.62
Feb ..	29.33	1.39	19.8	21.5	21.4	54	—10	29.0	13.8	14	16	81	80	1.57	.23
Mar ..	29.20	.95	33.4	33.7	34.8	58	20	40.5	29.0	26	27	78	78	1.73	.78
Apr ..	29.24	1.10	44.8	45.4	45.0	83	28	51.8	38.1	36	37	73	75	3.64	1.12
May .	29.20	.58	56.9	58.7	57.5	89	35	64.7	50.3	46	48	68	70	2.51	.68
June .	29.25	.77	62.8	64.3	63.7	82	45	70.1	57.3	56	56	78	75	6.02	3.13
July .	29.23	.59	69.9	71.7	76.4	87	54	77.5	63.2	62	62	75	72	1.68	.64
Aug ..	29.32	.52	66.4	69.5	67.4	81	52	74.6	60.1	56	57	70	66	2.26	.89
Sept .	29.27	.79	61.0	63.0	62.8	85	42	69.4	56.2	53	56	75	77	4.85	.97
Oct ..	29.31	.86	44.9	46.9	46.2	69	30	52.3	40.2	37	39	74	75	3.37	.84
Nov ..	29.27	1.24	40.8	42.3	42.5	68	25	48.1	36.9	35	37	81	82	3.29	1.04
Dec ..	29.32	1.16	38.6	39.6	40.8	70	12	49.2	32.3	33	33	81	79	4.03	.54
Year .	29.26	.94	47.4	49.0	48.7	89	—10	55.4	42.0	40	41	76	76	37.66	....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

FORT ELLIOTT, TEX.

[H=2,690. T=14. h=2.]

Month and year.	Mean cloudiness (in tenths).	Wind.													Number of days.								
		Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan.	3.0	12.9	55	NW.	NW.	7	0	1	9	6	4	1	28	6	18	5	8	4	2	30	0	0	0
Feb.	3.4	11.8	54	NW.	NW.	7	3	0	9	3	7	3	18	6	19	1	8	6	3	24	0	0	0
Mar.	4.7	14.3	48	SE.†	NW.	13	4	1	10	5	5	2	17	5	17	3	11	7	1	3	0	1	0
Apr.	3.2	13.0	54	S.	N.	20	1	4	13	5	4	2	5	6	18	5	7	6	0	0	0	3	0
May.	4.0	16.5	60	SE.	SE.	10	2	1	22	11	5	0	7	4	11	13	7	7	0	0	4	3	0
June	5.2	12.7	48	SE.	SE.	3	7	3	17	10	9	0	4	7	10	9	11	5	0	0	7	3	0
July	4.5	12.9	36	SE.†	S.	8	5	5	10	11	9	3	1	10	14	12	5	4	0	0	18	4	0
Aug.	4.1	13.7	36	SE.†	SE.	0	4	2	34	7	5	2	0	8	14	10	7	4	0	0	15	1	0
Sept	4.4	12.4	48	N.	S.	5	2	8	6	13	10	1	3	12	13	10	7	6	0	0	4	1	0
Oct.	5.0	11.9	44	N.	N.	17	5	8	13	2	8	4	1	4	15	4	12	6	0	0	2	0	0
Nov.	4.1	11.9	54	N.	N.	27	3	1	6	3	5	1	9	5	18	2	10	3	0	21	0	0	0
Dec.	3.1	12.5	54	SW.	SW.	6	1	3	7	13	20	1	9	2	18	12	1	0	0	7	0	0	0
Year	4.1	13.0	..	.....	SE.	123	37	37	156	89	91	20	102	75	185	86	94	58	6	85	50	16	0

EL PASO, TEX.

[H=3,796. T=60. h=62.]

Jan.	3.1	7.0	36	NW.†	NW.	6	9	11	1	0	1	6	13	15	12	11	8	6	0	18	0	0	0
Feb.	2.4	8.7	48	W.	NW.	14	8	7	1	0	0	6	17	3	11	13	4	1	0	12	0	0	0
Mar.	2.9	9.3	48	NW.	NW.	7	11	9	3	0	0	11	18	3	14	10	7	4	0	1	0	1	0
Apr.	0.8	9.3	44	NW.	NW.	8	8	12	2	0	1	9	19	1	24	4	2	1	0	0	2	0	0
May.	2.1	11.0	48	W.	NW.	3	5	14	1	0	1	10	25	3	20	8	3	0	0	0	16	0	0
June	2.8	9.6	45	NE.	NW.	1	8	15	0	2	3	11	19	1	16	13	1	2	0	0	25	4	0
July	2.4	7.7	46	NE.	E.	2	11	25	5	2	0	2	11	4	21	10	0	7	0	0	26	6	0
Aug.	2.1	7.1	31	N.	E.	1	14	36	2	1	0	2	5	1	24	5	2	2	0	0	27	2	0
Sept	4.0	8.5	48	NE.	E.	3	9	28	0	0	0	1	19	0	15	8	7	11	0	0	11	1	0
Oct.	1.5	6.8	36	N.	E.	3	11	17	1	0	1	2	14	13	24	5	2	3	0	0	0	1	0
Nov.	1.7	6.9	37	NE.	NW.	9	14	9	1	0	0	2	15	10	25	2	3	2	0	15	0	0	0
Dec.	2.5	4.6	33	NW.†	NW.	7	9	4	7	0	0	1	23	11	21	10	0	0	0	6	0	0	0
Year	2.4	8.0	..	.....	NW.	64	117	187	24	5	7	63	198	65	227	99	39	39	0	52	107	15	0

ERIE, PA.

[H=714. T=02. h=82.]

Jan.	7.8	14.0	50	SW.	S.	1	5	7	3	19	13	12	2	0	2	11	18	19	6	21	0	0	0
Feb.	7.3	13.5	42	SE.	SW.	1	4	2	1	12	20	8	7	1	3	7	18	20	14	26	0	0	0
Mar.	4.9	10.5	35	S.	SW.†	3	16	7	2	4	16	11	3	0	11	12	8	10	3	21	0	1	0
Apr.	5.6	10.5	42	W.	W.	4	9	9	1	9	11	13	4	0	9	10	11	14	0	7	0	1	0
May.	6.1	10.2	37	NE.	SW.	3	4	3	6	8	17	12	9	0	9	11	11	14	0	0	0	6	0
June	6.2	10.0	35	SW.	SW.	2	2	3	6	13	16	13	4	1	3	9	18	18	0	0	0	7	0
July	4.0	8.6	35	NE.	SW.	4	6	4	5	12	18	7	6	0	15	9	7	10	0	0	0	7	0
Aug.	3.6	8.6	27	S.	SW.	4	5	6	0	17	20	3	6	1	16	8	7	6	0	0	0	4	0
Sept	5.2	11.5	36	NW.	S.	1	4	10	5	19	10	4	7	0	10	9	11	15	0	0	0	4	0
Oct.	6.4	11.6	36	NW.	SW.	11	5	10	7	8	14	0	7	0	7	9	15	12	0	2	0	3	0
Nov.	7.9	12.1	37	S.	SW.	1	3	7	3	11	21	11	3	0	4	6	20	18	0	7	0	0	0
Dec.	6.4	14.9	48	W.	SW.	1	1	5	5	12	18	14	6	0	7	10	14	17	0	14	0	2	0
Year	6.0	11.3	.	.....	SW.	36	64	73	44	144	194	108	64	3	96	111	158	173	23	98	0	35	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

EUREKA, CAL.

[Lat., 40° 48′ N.; Long., 124° 11′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	*In.*	*In.*	°	°	°	°	°	°	°	°	°	%	%	*In.*	*In.*
Jan ..	30.04	.67	43.6	52.3	46.9	71	29	55.1	38.7	39	44	85	74	4.25	1.58
Feb ..	30.10	.78	43.7	52.1	48.2	68	28	55.8	40.7	41	44	92	76	1.93	0.65
Mar ..	29.88	1.14	48.8	55.3	52.2	66	39	58.8	45.6	45	48	88	77	5.91	1.71
Apr ..	30.00	.55	50.0	55.2	53.2	68	40	58.4	48.1	47	49	90	81	3.49	1.02
May .	29.95	.47	51.2	56.6	54.8	69	44	60.3	49.4	49	51	92	82	7.20	1.54
June .	29.94	.28	51.8	57.0	55.0	66	45	59.9	50.0	50	51	94	81	0.37	.36
July .	29.94	.32	52.5	57.1	55.6	67	46	59.9	51.2	51	53	96	86	0.15	.04
Aug ..	29.95	.32	51.8	58.0	55.4	69	47	60.6	50.3	51	52	96	82	0.13	.09
Sept .	29.95	.42	51.3	59.2	56.0	77	40	63.1	48.8	48	50	91	74	0.32	.13
Oct ..	29.92	.89	53.1	58.9	56.2	71	41	62.8	49.7	50	53	90	82	8.36	3.06
Nov ..	30.02	.71	49.2	56.5	53.2	73	38	60.6	45.7	45	49	88	77	3.71	.79
Dec ..	29.87	.89	43.6	49.2	46.6	60	34	52.8	40.4	40	42	86	77	12.88	2.43
Year .	29.96	.62	49.2	55.6	52.8	77	28	59.0	46.6	46	49	91	79	48.70	.....

FORT SMITH, ARK.

[Lat., 35° 22′ N.; Long., 94° 24′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.60	.84	34.7	44.2	41.1	65	13	50.1	32.1	30	35	85	72	5.33	2.04
Feb ..	29.68	1.05	33.4	46.0	42.4	72	16	53.9	31.0	28	31	79	59	1.95	.76
Mar ..	29.52	1.04	44.4	56.5	53.2	83	26	64.1	42.3	38	39	80	55	4.53	1.39
Apr ..	29.51	.65	57.0	68.7	65.7	87	43	77.3	54.1	49	50	76	54	1.83	.58
May .	29.52	.61	61.8	71.5	68.0	90	40	78.9	57.0	56	58	81	63	4.70	1.81
June .	29.51	.60	68.6	76.4	73.6	94	50	83.6	63.6	63	65	83	68	5.37	1.56
July .	29.49	.42	75.8	83.0	81.2	98	60	91.2	71.3	70	70	84	68	4.64	1.62
Aug ..	29.58	.24	70.7	79.9	77.9	98	59	89.1	66.7	66	67	85	66	1.44	1.13
Sept .	29.55	.74	63.2	70.8	70.2	92	42	80.4	60.1	60	61	89	73	5.35	2.68
Oct ..	29.60	.68	53.6	63.7	62.6	87	31	74.8	50.5	47	48	80	59	0.70	0.32
Nov ..	29.64	.95	38.8	48.2	46.0	76	21	55.8	36.3	34	36	84	64	5.93	1.49
Dec ..	29.64	.88	50.0	59.3	57.8	79	26	68.2	47.3	44	47	82	66	1.43	1.18
Year .	29.57	.72	54.3	64.0	61.6	98	13	72.3	51.0	49	51	82	64	43.20	.....

FRESNO, CAL.

[Lat., 36° 43′ N.; Long., 119° 49′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.74	.83	36.8	50.3	43.8	63	28	53.0	34.5	36	42	97	74	0.34	0.29
Feb ..	29.76	.68	41.3	59.7	50.2	75	27	62.2	38.1	38	41	90	52	0.32	0.23
Mar ..	29.62	.87	49.1	66.8	58.4	84	38	70.3	46.5	46	47	91	53	2.07	0.55
Apr ..	29.64	.42	51.7	74.8	63.5	93	41	77.0	50.0	47	46	85	38	0.54	0.32
May .	29.58	.49	56.6	81.9	69.6	101	44	84.1	55.2	49	43	77	28	0.57	0.33
June .	29.48	.36	63.4	94.4	79.5	106	55	96.7	62.3	51	47	65	21	.00	.00
July .	29.49	.45	65.6	100.0	82.6	112	55	101.7	63.6	48	40	54	13	.00	.00
Aug ..	29.48	.38	66.0	99.2	82.2	110	54	101.0	63.3	44	37	47	12	T.	T.
Sept .	29.55	.44	61.5	90.8	75.6	105	50	92.9	58.2	42	40	51	18	.00	.00
Oct ..	29.64	.52	55.6	70.7	62.8	98	42	74.8	50.8	49	49	81	52	3.17	1.73
Nov ..	29.76	.48	47.0	61.1	54.1	72	36	64.9	43.3	44	47	89	63	1.39	0.48
Dec ..	29.62	.66	45.3	51.9	49.1	65	31	55.1	43.1	43	46	91	81	3.87	0.75
Year .	29.62	.55	53.3	75.1	64.3	112	27	77.8	50.7	45	44	76	42	12.27	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

EUREKA, CAL.

[H=64. T=60. h=52.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan	4.6	5.1	36	N.	N.	17	2	3	15	3	9	0	3	10	13	9	9	13	0	3	0	0	0
Feb	5.0	4.8	44	N.	N.	16	4	2	7	3	10	2	5	7	8	8	12	10	0	2	0	0	0
Mar	6.9	6.3	36	SE.	SE.	6	3	2	23	6	10	2	7	3	2	10	19	15	0	0	0	0	0
Apr	7.0	7.5	40	N.	SW.†	13	1	1	5	6	16	2	12	4	2	7	21	14	0	0	0	0	0
May	6.4	7.9	28	SW.†	S.	14	3	1	5	14	11	2	9	3	6	9	16	15	0	0	0	0	0
June	5.3	6.4	30	N.	N.	19	0	0	2	2	11	5	13	8	8	10	12	2	0	0	0	0	0
July	7.4	5.3	30	NW.	NW.	18	0	0	1	2	15	2	21	3	6	3	22	0	0	0	0	0	0
Aug	4.9	5.1	24	NW.	NW.	14	0	1	6	5	10	2	18	6	10	13	8	2	0	0	0	0	0
Sept	3.9	5.2	36	N.	SW.	10	2	1	4	0	16	0	14	13	15	7	8	4	0	0	0	0	0
Oct	7.2	4.6	36	SE.	SE.	10	1	1	19	8	7	1	8	7	4	10	17	19	0	0	0	1	0
Nov	5.2	4.2	34	SE.	SE.†	11	0	0	11	4	4	0	1	29	11	7	12	10	0	0	0	0	0
Dec	7.1	5.7	36	SW.	SE	3	2	0	25	11	9	1	2	9	5	6	20	24	0	0	0	1	0
Year	5.9	5.7	..	......	N.	151	18	12	123	64	128	19	113	102	90	99	176	128	0	5	0	2	0

FORT SMITH, ARK.

[H=470. T=54. h=48.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	4.8	5.0	20	NW.	SE.	7	5	3	21	2	7	4	9	4	11	10	10	16	1	17	0	1	0
Feb	4.3	5.2	24	NW.	SE.	8	5	10	16	3	3	5	5	1	14	5	9	8	2	16	0	0	0
Mar	4.4	5.2	23	NE.	NE.	10	14	11	8	2	1	3	9	4	15	7	9	14	0	3	0	0	0
Apr	3.6	5.4	24	E.	SE.	10	4	9	13	3	9	7	3	2	18	8	4	9	0	0	0	3	0
May	4.4	5.4	24	NW.†	S.	6	2	4	13	15	10	3	9	0	16	9	6	9	0	0	0	6	0
June	4.5	3.8	36	SW.	SE.	7	5	6	22	11	2	3	2	2	9	14	7	17	0	0	3	1	1
July	3.6	3.2	18	S.	SE.	3	3	12	22	6	12	2	2	0	18	6	7	10	0	0	19	1	0
Aug	2.8	3.7	20	E.	SE.	4	2	13	33	2	3	1	1	3	22	5	4	5	0	0	10	2	0
Sept	5.8	4.2	17	SE.	SE.	8	8	4	23	4	5	4	2	2	12	6	12	19	0	0	3	0	0
Oct	3.7	2.0	15	NE.	SE.	5	10	4	15	4	4	3	3	14	17	6	8	5	0	1	0	2	0
Nov	4.6	3.2	18	NW.	NW.	10	3	4	5	6	1	4	16	11	13	7	10	13	0	9	0	1	0
Dec	3.5	2.9	18	E.	SE.	5	1	4	14	7	11	7	3	10	19	8	4	5	0	2	0	0	0
Year	4.2	4.1	..	......	SE.	83	62	84	205	65	68	46	64	53	184	91	90	130	3	48	35	17	1

FRESNO, CAL.

[H=328. T=67. h=55.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	2.2	2.8	12	NW.†	W.	5	3	4	7	11	4	16	8	4	16	5	10	2	0	12	0	0	0
Feb	2.5	4.5	28	NW.†	NW.	8	4	13	3	1	4	7	14	2	18	4	6	3	0	3	0	0	0
Mar	3.4	6.2	24	E.	E.	5	2	22	3	12	0	10	8	0	12	8	11	6	0	0	0	2	0
Apr	2.9	6.1	20	NW.†	W.	6	2	6	2	3	1	21	18	1	19	4	7	4	0	0	4	0	0
May	2.4	7.5	24	NW.	NW.	9	2	4	2	3	0	15	25	2	19	7	5	4	0	0	11	1	0
June	1.2	7.6	24	W.	NW.	5	1	1	0	0	1	18	33	1	24	6	0	0	0	0	24	0	0
July	0	7.1	22	NW.	NW.	2	0	0	2	2	1	21	34	0	31	0	0	0	0	0	31	0	0
Aug	0.7	6.0	23	NW.	NW.	14	1	1	2	5	2	12	25	0	30	1	0	0	0	0	31	0	0
Sept	0.9	5.4	16	NW.	NW.	4	0	4	3	3	0	9	37	0	26	4	0	0	0	0	17	0	0
Oct	4.6	4.8	24	NW.†	NW.	4	4	15	6	6	1	7	19	0	13	9	9	10	0	0	3	0	0
Nov	4.5	3.6	22	N.	E.	16	3	20	3	4	0	9	5	0	12	10	8	6	0	0	0	0	0
Dec	7.3	5.8	24	E.	E.	4	2	26	5	11	0	10	3	1	2	15	14	19	0	1	0	0	0
Year	2.7	5.6	..	......	NW.	82	24	116	38	61	14	155	229	11	222	73	70	54	0	16	121	3	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

GALVESTON, TEX.

[Lat., 29° 18′ N.; Long., 94° 50′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	30.06	.74	50.9	53.8	52.8	70	32	57.7	47.8	47	49	88	83	7.81	2.28
Feb ..	30.14	.72	52.5	55.3	54.4	69	42	58.4	50.4	48	50	87	84	2.94	2.00
Mar ..	29.98	.72	56.5	60.5	60.0	73	45	65.1	54.8	51	53	84	78	3.31	1.96
Apr ..	29.98	.64	68.1	70.3	70.2	79	58	74.8	65.6	64	63	86	78	1.40	0.64
May .	30.00	.44	71.4	74.4	73.7	88	57	78.3	69.1	65	64	81	71	1.81	1.35
June .	29.95	.31	78.1	79.1	79.0	86	68	82.9	75.2	72	72	83	80	4.79	2.24
July .	29.98	.28	81.9	83.6	83.8	90	72	87.8	79.8	75	75	81	75	0.75	0.49
Aug ..	29.98	.33	79.1	82.2	81.5	92	70	86.3	76.7	73	73	83	74	5.11	1.34
Sept .	29.96	.50	75.5	78.4	77.5	88	57	82.7	72.3	70	69	82	75	3.98	2.00
Oct ..	30.06	.39	68.8	73.0	72.2	85	56	77.6	66.7	62	62	80	71	T.	T.
Nov ..	30.12	.80	56.7	60.8	59.6	77	39	66.3	52.9	51	53	82	76	5.39	1.85
Dec ..	30.16	.59	64.3	65.8	66.4	75	47	70.1	62.7	62	64	93	93	0.23	0.14
Year .	30.03	.54	67.0	69.8	69.3	92	32	74.0	64.5	62	62	84	78	37.52	.....

GRAND HAVEN, MICH.

[Lat., 43° 5′ N.; Long., 86° 13′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.29	1.52	27.6	30.1	29.0	53	11	33.6	24.4	24	26	88	84	1.61	0.66
Feb ..	29.40	1.48	17.1	21.5	19.4	41	—10	25.6	13.3	14	17	87	84	2.80	0.57
Mar ..	29.32	.70	31.7	36.9	35.4	69	17	41.8	29.1	26	27	82	70	0.40	0.15
Apr ..	29.33	.92	41.0	45.2	43.4	73	22	50.9	35.8	32	34	72	68	1.75	0.95
May .	29.28	.65	50.7	55.1	52.3	81	32	60.2	44.4	40	43	70	67	4.01	0.77
June .	29.31	.77	56.2	61.0	59.0	85	40	66.2	51.9	52	53	88	76	4.21	0.82
July .	29.31	.59	66.0	69.3	67.0	86	50	74.2	59.7	59	57	78	66	2.23	0.69
Aug ..	29.40	.46	64.1	69.1	66.4	91	46	74.2	58.7	56	56	75	65	0.56	0.24
Sept .	29.34	.72	58.5	62.6	61.2	88	30	68.7	53.6	51	50	78	64	2.88	2.10
Oct ..	29.46	.92	38.2	44.6	44.2	64	24	53.4	35.1	34	36	84	74	.47	.29
Nov ..	29.36	1.14	37.3	38.3	38.8	55	18	43.5	34.0	32	32	83	81	2.34	.88
Dec ..	29.36	1.24	36.4	38.0	37.4	55	16	43.0	31.8	31	32	82	81	3.17	.65
Year .	29.35	.93	43.7	47.6	46.1	91	—10	52.9	39.3	38	39	81	73	26.43	.....

FORT GRANT, ARIZ.

[Lat., 32° 39′ N.; Long., 109° 57′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	25.20	0.57	34.3	42.2	40.0	61	20	48.5	31.6	24	25	69	52	1.99	1.24
Feb ..	25.24	.58	37.8	49.3	45.4	65	22	55.9	34.8	24	24	62	40	1.28	.66
Mar ..	25.22	.43	44.4	56.5	51.8	76	34	61.9	41.6	34	38	68	52	1.04	.42
Apr ..	25.22	.45	53.8	70.6	62.6	86	38	74.7	50.5	30	38	43	32	0.13	.13
May .	25.22	.34	60.6	76.5	68.6	91	42	80.7	56.5	28	24	30	16	T.	T.
June .	25.24	.28	67.3	82.2	75.6	98	51	87.8	63.5	43	33	44	20	1.06	.60
July .	25.28	.27	69.5	83.8	78.8	100	58	91.1	66.6	56	51	66	37	3.57	1.81
Aug ..	25.24	.28	70.3	84.7	80.0	97	62	92.1	68.0	54	50	56	32	1.35	.40
Sept .	25.23	.33	60.8	73.7	70.2	93	40	82.3	58.2	47	47	60	41	.69	.34
Oct ..	25.27	.39	57.2	67.1	64.6	88	39	75.4	53.9	38	38	51	34	.94	.52
Nov ..	25.27	.48	42.5	53.1	50.2	72	26	61.6	38.7	22	23	44	32	.16	.10
Dec ..	25.25	.40	47.3	52.6	51.6	71	27	59.2	44.0	32	34	55	50	1.11	.57
Year .	25.24	.40	53.8	66.0	61.6	100	20	72.6	50.7	36	35	54	36	13.32	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
GALVESTON, TEX. [H=42. T=94. h=88.]																							
1889.																							
Jan ..	6.4	12.9	40	N.	SE.	17	6	3	18	4	6	4	3	1	7	6	18	15	0	0	0	1	0
Feb ..	6.6	10.9	40	N.	E.†	8	12	16	4	10	5	1	0	0	5	3	20	11	0	0	0	1	0
Mar ..	4.2	11.1	35	NW.	S.	14	3	8	7	14	6	4	6	0	15	5	11	8	0	0	0	0	0
Apr ..	4.6	11.0	35	N.	S.	6	6	2	12	21	6	1	6	0	11	10	9	4	0	0	0	0	0
May .	4.1	13.2	50	E.	S.	6	7	2	15	21	4	2	5	0	12	11	8	2	0	0	..	2	0
June .	5.4	10.7	30	SE.	S.	1	0	2	14	33	9	0	1	0	7	14	9	9	0	0	0	4	0
July .	4.1	9.9	24	S.	SW.	0	0	1	4	21	29	6	0	1	17	7	7	3	0	0	1	1	0
Aug ..	5.5	9.6	44	NE.	SE.	1	13	9	16	14	7	0	2	0	10	9	12	10	0	0	3	0	0
Sept .	5.3	11.9	36	N.	SE.	8	10	4	15	11	8	1	1	2	11	10	9	12	0	0	0	2	0
Oct ..	2.1	8.5	36	N.	NE.	2	14	6	11	8	12	1	7	1	28	2	1	0	0	0	0	0	0
Nov ..	4.2	10.9	54	NW.	N.	11	5	7	11	6	2	9	8	1	18	4	8	8	0	0	0	1	0
Dec ..	4.6	9.2	36	N.	S.	3	1	1	26	25	4	1	0	1	15	7	9	4	0	0	0	0	0
Year .	4.8	10.8	...	......	S.	77	77	61	153	188	98	30	39	7	156	88	121	86	0	0	4	12	0
GRAND HAVEN, MICH. [H=621. T=55. h=47.]																							
Jan ..	7.9	13.0	60	NW.	SW.	7	5	10	7	6	11	8	8	0	4	4	23	13	12	28	0	0	0
Feb ..	9.0	12.6	48	W.	W.†	5	9	12	3	4	4	12	7	0	1	4	23	19	19	28	0	0	0
Mar ..	5.0	10.7	28	NW.†	NE.	10	13	9	3	5	8	4	10	0	8	15	8	6	4	24	0	0	0
Apr ..	6.0	11.8	37	SW.	NW.†	5	3	10	6	11	7	7	11	0	10	7	13	13	0	8	0	3	0
May .	6.6	13.0	33	NW.†	S.	9	7	5	5	14	7	5	10	0	2	17	12	16	0	0	0	4	0
June .	6.0	9.4	30	S.	S.	4	5	5	6	19	7	6	8	0	2	18	10	18	0	0	0	3	0
July .	4.0	8.1	35	S.	S.	10	0	6	8	15	7	5	10	1	14	13	4	7	0	0	0	2	0
Aug ..	3.3	9.2	32	W.	S.	8	3	7	8	16	10	6	4	0	16	12	3	9	0	0	1	1	0
Sept .	(*)	....	(‡)	......	S.	10	2	7	9	12	10	4	6	0	...	..	...	9	0	1	0	..	..
Oct ..	4.5	6.6	40	SW.	NE.	3	14	10	4	3	4	1	6	0	12	3	8	4	0	9	0	1	0
Nov ..	8.1	10.4	48	SW.	NE.	8	11	8	5	4	7	6	10	1	3	5	22	16	1	9	0	0	0
Dec ..	7.0	12.4	56	W.	E.	4	3	12	10	8	11	7	6	1	6	8	17	16	2	12	0	2	0
Year .	...	....	...	......	S.	83	75	101	74	117	93	71	96	3	...	..	...	146	..	120	1	..	..
FORT GRANT, ARIZ. [H=4,916 B. T=16. h=4.]																							
Jan ..	2.8	6.9	36	E.	NW.	13	9	11	8	0	0	5	16	0	17	9	5	4	0	18	0	0	0
Feb ..	3.0	6.0	48	E.	W.†	7	13	6	5	2	2	13	8	0	16	7	5	5	0	8	0	0	0
Mar ..	3.0	8.1	36	SE.	W.	6	8	8	8	1	9	12	9	1	15	9	7	6	0	0	0	1	0
Apr ..	1.4	6.0	24	S.	NW.	6	14	5	6	0	0	8	21	0	24	4	2	1	0	0	0	0	0
May .	1.3	7.0	24	N.†	NW.	14	6	11	5	1	1	8	16	0	23	8	0	0	0	0	2	0	0
June .	3.6	7.0	34	SE.	NW.	7	11	8	6	0	4	9	13	2	13	12	5	5	0	0	9	4	0
July .	5.1	6.4	36	SW.	NW.	3	9	10	15	0	5	1	18	1	9	13	9	11	0	0	20	7	0
Aug ..	3.8	6.3	26	NE.	S.	11	6	14	7	16	2	3	3	0	15	10	6	7	0	0	27	2	0
Sept .	2.8	8.2	36	NE.	W.	6	6	12	2	2	3	17	12	0	19	7	4	6	0	0	6	0	0
Oct ..	1.8	6.8	28	W.	W.	6	5	8	3	4	7	20	9	0	24	5	2	2	0	0	0	1	0
Nov ..	1.1	5.9	34	E.	W.	3	4	7	2	2	4	24	14	0	25	4	1	3	0	5	0	0	0
Dec ..	4.9	5.1	26	NE.	W.	11	7	8	3	2	1	17	11	2	12	8	11	6	0	2	0	0	0
Year .	2.9	6.6	...	......	NW.	93	98	108	70	30	38	137	150	6	212	96	57	56	0	33	64	15	0

* Records destroyed by fire. ‡ Estimated.

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

GREEN BAY, WIS.

[Lat., 44° 31′ N.; Long., 88° 0′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	29.32	1.45	16.6	23.1	20.2	43	−2	26.5	13.8	13	19	85	83	3.75	2.20
Feb ..	29.44	1.28	6.7	15.1	10.6	35	−24	18.8	2.5	2	11	82	82	3.32	1.71
Mar ..	29.35	.69	30.2	35.8	34.0	61	16	41.8	26.2	24	27	80	73	0.74	0.42
Apr ..	29.34	1.02	41.5	47.6	45.7	74	23	55.3	36.1	32	34	70	62	1.09	0.20
May .	29.30	.60	51.0	55.7	54.0	82	30	63.7	44.4	42	42	72	65	4.75	1.32
June .	29.32	.77	57.2	62.2	60.4	85	40	69.3	51.4	52	54	83	76	3.06	1.42
July .	29.30	.62	65.6	70.3	68.6	96	50	79.0	58.3	58	58	77	67	2.55	0.92
Aug ..	29.38	.57	63.8	69.3	67.4	90	43	77.3	57.5	55	57	75	66	1.36	0.59
Sept .	29.32	.75	55.5	60.6	60.1	86	33	68.7	51.4	50	51	83	71	4.68	3.30
Oct ..	29.50	.87	38.2	44.0	43.2	65	26	51.0	35.3	32	34	78	69	0.26	0.12
Nov ..	29.49	1.13	28.9	33.6	32.3	54	6	38.1	26.5	25	26	84	75	3.62	1.08
Dec ..	29.36	1.26	28.9	33.0	31.2	50	6	36.7	25.7	25	27	86	81	3.38	0.78
Year .	29.36	.93	40.3	45.9	44.0	90	−24	52.2	35.8	34	37	80	72	32.56	.....

HARRISBURG, PA.

[Lat., 40° 16′ N.; Long., 76° 52′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.68	1.40	31.2	34.0	32.4	62	13	39.3	25.5	24	26	76	75	2.86	0.62
Feb ..	29.78	1.18	22.4	27.6	25.2	44	−1	31.2	19.2	15	20	74	73	1.48	0.71
Mar ..	29.56	1.13	37.3	42.7	40.8	62	23	47.7	34.0	30	34	77	74	3.26	2.13
Apr ..	29.62	1.08	47.8	53.4	51.8	80	34	60.2	43.3	41	43	80	69	3.96	1.10
May .	29.60	.62	58.8	64.3	62.6	90	40	71.9	53.4	51	53	76	68	9.51	6.16
June .	29.67	.79	65.1	69.6	68.5	87	50	76.8	60.2	58	61	78	75	7.18	1.62
July .	29.62	.57	71.2	74.7	73.8	92	57	81.8	65.8	64	66	81	75	8.68	2.26
Aug ..	29.72	.61	66.1	71.0	69.8	85	53	78.9	60.7	60	62	82	75	3.58	1.50
Sept .	29.68	.77	61.0	64.2	63.8	82	44	70.3	57.3	55	58	81	80	4.53	1.30
Oct ..	29.68	.89	46.2	50.8	50.2	76	29	57.8	42.5	40	44	81	78	3.33	0.98
Nov ..	29.72	1.19	41.2	43.5	42.8	62	24	47.6	38.0	36	37	83	79	6.59	1.36
Dec ..	29.80	1.23	37.4	41.3	40.2	66	14	47.7	32.6	31	34	78	75	2.11	0.46
Year .	29.68	.96	48.8	53.1	51.8	92	−1	59.3	44.4	42	45	79	75	57.07	.....

HATTERAS, N. C.

[Lat., 35° 15′ N.; Long., 75° 40′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	30.07	1.14	47.3	48.2	47.6	65	32	52.2	42.9	45	45	90	90	6.82	1.86
Feb ..	30.16	1.13	42.5	44.2	43.6	67	22	48.1	39.0	37	39	82	83	4.52	2.11
Mar ..	29.92	1.13	46.3	47.3	47.1	63	35	52.3	41.9	41	42	81	82	5.43	1.98
Apr ..	29.94	1.11	56.2	55.5	56.4	69	38	61.7	51.2	51	51	83	85	10.08	3.90
May .	29.98	.55	67.9	66.7	68.4	84	52	74.3	62.5	61	60	78	80	6.03	3.06
June .	30.10	.60	73.4	73.3	73.5	84	58	77.5	69.5	68	68	84	84	11.91	2.09
July .	30.04	.43	77.4	76.6	77.8	87	67	82.3	73.3	71	71	81	84	2.26	.63
Aug ..	30.10	.35	75.8	74.6	76.2	84	67	80.4	72.1	70	70	82	84	5.30	2.87
Sept .	30.03	.64	70.6	70.7	71.0	83	57	75.4	66.7	63	65	79	81	5.09	3.59
Oct ..	30.03	.60	60.4	60.7	61.0	78	46	65.7	56.2	54	55	82	83	4.84	2.18
Nov ..	30.12	.99	56.9	57.2	57.6	74	35	62.5	52.6	51	52	80	82	4.70	1.68
Dec ..	30.22	.79	52.9	54.7	54.6	69	38	59.9	49.3	49	51	88	89	.26	.22
Year .	30.06	.79	60.6	60.8	61.2	87	22	66.0	56.4	55	56	82	84	67.24	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

GREEN BAY, WIS.

[H=616. T=49. h=42.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	6.4	7.2	36	S.	S.	11	4	1	3	21	6	7	4	5	7	9	15	13	22	30	0	1	0
Feb ..	6.3	6.9	48	NE.†	S.	5	2	1	3	12	9	10	6	8	4	11	13	12	22	28	0	0	0
Mar ..	5.4	7.7	24	N.	S.	14	7	2	5	18	3	6	7	0	3	16	12	4	1	25	0	0	0
Apr ..	6.8	9.0	32	SW.†	S.	7	5	6	10	14	2	4	12	0	5	10	15	14	0	7	0	0	0
May .	7.0	9.2	34	SE.	S.	10	7	5	11	14	3	1	10	1	6	9	16	14	0	2	0	6	0
June .	7.0	7.2	36	NE.	S.	7	12	4	11	15	0	3	7	1	3	9	18	13	0	0	0	2	0
July .	6.6	6.3	33	W.	S.	7	3	5	13	21	1	5	4	3	6	11	14	12	0	0	0	3	0
Aug ..	5.9	6.3	36	SE.	S.	5	4	4	15	16	3	6	2	7	8	11	12	11	0	0	1	4	0
Sept .	6.1	7.1	25	S.	S.	5	1	0	10	19	3	4	10	8	8	7	15	14	0	0	0	1	0
Oct ..	6.2	7.6	30	N.	N.	17	6	4	8	12	4	1	8	2	8	11	12	5	0	9	0	1	0
Nov ..	6.1	8.9	36	N.	S.	14	9	1	2	15	6	6	6	1	9	7	14	8	4	22	0	0	0
Dec ..	7.3	8.0	36	N.	S.	8	4	3	8	18	9	5	4	3	5	8	18	16	5	26	0	0	0
Year .	6.4	7.6	..	.....	S.	110	64	36	99	195	49	58	80	39	72	119	174	136	54	149	1	18	0

HARRISBURG, PA.

[H=36. T=94. h=87.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	5.2	8.0	48	NW.	NW.	7	2	16	4	1	6	6	17	3	7	12	12	11	5	24	0	0	0
Feb ..	6.0	8.9	36	NW.	NW.	0	9	7	3	4	3	12	16	2	9	5	14	9	12	27	0	0	0
Mar ..	6.2	10.0	34	NW.	NW.	9	11	5	6	2	7	10	12	0	7	9	15	9	0	7	0	0	0
Apr ..	6.0	9.1	36	NW.	N.	15	8	7	7	2	5	6	10	0	6	12	12	13	0	0	0	2	0
May .	5.0	6.6	36	NW.	W.	8	4	8	8	4	7	13	10	0	4	19	8	12	0	0	0	3	0
June .	6.4	5.5	30	NW.	E.	4	3	13	1	9	10	11	8	1	5	15	10	20	0	0	0	1	0
July .	5.5	5.9	23	NE.	E.	4	6	15	9	6	6	14	2	0	7	14	10	18	0	0	2	2	0
Aug ..	3.7	3.6	18	NW.	W.	3	4	5	1	5	6	15	7	16	15	12	4	8	0	0	0	0	0
Sept	6.3	7.0	30	W.	W.	9	5	9	5	8	3	13	2	6	8	7	15	17	0	0	0	0	0
Oct ..	6.2	6.9	31	NW.	N.	14	4	5	9	0	3	9	11	7	7	11	13	13	0	1	0	0	0
Nov ..	7.0	7.4	34	NW.	W.	5	3	11	3	5	1	19	9	4	4	9	17	18	0	5	0	0	0
Dec ..	5.3	6.6	54	W.	E.	4	4	16	3	3	8	14	9	1	13	5	13	14	1	13	0	0	0
Year .	5.7	7.1	..	.....	W.	82	63	117	59	49	65	142	113	40	92	130	143	162	18	77	2	8	0

HATTERAS, N. C.

[H=11. T=17. h=2.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	4.6	15.4	42	SE.	N.	18	8	3	4	6	5	11	7	0	11	9	11	11	0	0	0	0	0
Feb ..	5.4	17.2	52	NW.	N.	17	10	0	0	4	8	5	12	0	8	6	14	8	0	2	0	1	0
Mar ..	4.3	16.0	56	N.	NW.	12	10	4	5	6	3	6	16	0	13	7	11	9	0	0	0	2	0
Apr ..	5.1	17.8	80	N.	SW.†	12	11	5	4	11	12	3	2	0	11	7	12	12	0	0	0	1	0
May .	3.4	12.8	50	NW.	N.	12	10	8	5	8	11	3	5	0	16	11	4	10	0	0	0	1	0
June .	5.6	12.3	40	SE.	S.	3	9	0	2	23	16	4	3	0	11	7	12	14	0	0	0	1	0
July .	4.5	11.4	36	W.	S.	5	6	2	1	28	12	7	1	0	15	7	9	16	0	0	0	5	0
Aug ..	4.5	10.5	36	NW.	NE.	11	14	4	3	7	11	8	3	1	13	10	8	14	0	0	0	2	0
Sept .	4.0	14.4	45	N.	NE.	11	12	7	1	10	5	3	6	0	15	7	8	9	0	0	0	2	0
Oct ..	3.2	15.4	76	N.	N.	15	8	4	7	6	9	5	8	0	21	3	7	8	0	0	0	0	0
Nov ..	3.6	14.2	46	N.	NE.	5	16	1	4	7	9	10	7	1	16	9	5	12	0	0	0	1	0
Dec ..	3.0	11.6	44	N.	SW.	15	11	1	2	6	19	5	3	0	21	7	3	3	0	0	0	0	0
Year .	4.3	14.1	..	.....	N.	136	125	39	38	122	120	75	73	2	171	90	104	126	0	2	0	16	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

HELENA, MONT.

[Lat., 46° 34′ N.; Long., 112° 4′ W.]

Months and year.	Pressure.		Temperature.							Dew-point.		Relative humidity.		Precipitation.	
	Mean.	Range.	8 a. m.	8 p. m.	Mean (max. and min.).	Maximum.	Minimum.	Mean. Maximum.	Mean. Minimum.	8 a. m.	8 p. m.	8 a. m.	8 p. m.	Total.	Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	25.86	.75	12.4	17.8	16.7	48	—14	27.3	6.1	6	11	78	75	.42	.22
Feb ..	25.89	.76	20.2	27.5	25.2	61	—15	34.5	15.9	13	16	76	66	.72	.36
Mar ..	25.82	.90	31.8	44.6	39.1	64	4	49.7	28.5	25	28	77	55	.64	.22
Apr ..	25.80	.80	40.0	56.3	49.2	76	25	60.9	37.4	28	26	62	36	.11	.04
May .	25.76	.83	45.5	60.2	53.2	80	31	61.0	42.4	34	33	68	41	2.20	.78
June .	25.82	.63	54.4	72.2	63.4	89	40	75.4	51.5	38	37	57	32	.40	.28
July .	25.86	.58	57.0	75.4	66.8	91	39	79.8	53.8	41	37	58	28	.34	.15
Aug ..	25.83	.74	55.5	77.1	67.2	93	40	81.6	52.9	35	29	48	20	.31	.30
Sept .	25.88	.72	46.0	61.3	55.2	80	28	66.8	43.7	28	24	53	28	.48	.24
Oct ..	25.88	.57	42.4	54.2	50.7	80	30	61.1	40.3	26	26	55	38	.14	.06
Nov ..	25.91	.82	28.0	33.7	31.4	54	12	39.9	22.8	18	21	68	65	.77	.56
Dec ..	25.70	.66	20.6	25.6	22.6	47	— 9	30.2	14.9	15	17	80	71	.18	.13
Year .	25.83	.73	37.8	50.5	45.1	93	—15	55.9	34.2	26	25	65	46	6.71	.....

HURON, S. DAK.

[Lat., 44° 21′ N.; Long., 98° 10′ W.]

Jan ..	28.64	2.12	7.6	15.6	12.7	42	—25	23.1	2.3	2	9	80	75	1.26	0.52
Feb ..	28.72	1.55	6.1	13.6	10.6	45	—30	21.2	0.1	2	7	83	76	0.93	0.28
Mar ..	28.66	.78	26.2	41.4	36.3	70	8	49.5	23.1	18	27	71	59	0.19	0.06
Apr ..	28.60	.91	40.9	55.9	49.6	84	21	62.9	36.3	31	32	68	45	3.41	1.59
May .	28.54	1.48	48.5	62.7	54.8	90	22	67.5	42.0	39	42	72	49	3.04	1.26
June .	28.56	.61	59.0	73.4	66.4	98	40	80.3	52.4	51	52	77	48	1.04	0.42
July .	28.54	.58	63.8	76.8	70.9	104	44	82.7	59.1	58	58	82	56	3.51	1.36
Aug ..	28.58	.65	61.2	79.1	71.6	97	46	86.0	57.2	54	56	79	48	0.66	0.25
Sept .	28.57	.89	47.2	63.0	57.2	92	32	70.5	44.0	41	44	79	52	3.89	2.28
Oct ..	28.72	.75	36.7	50.3	46.8	78	17	59.7	33.9	30	35	77	60	0.55	0.20
Nov ..	28.72	1.05	20.1	29.7	28.2	62	— 4	39.6	16.8	12	18	72	63	0.16	0.08
Dec ..	28.56	1.02	19.9	28.9	26.4	55	—12	37.5	15.2	12	19	72	67	1.53	0.90
Year .	28.62	1.12	36.4	49.2	44.3	104	—30	56.7	31.9	29	33	76	58	20.17	.....

INDIANAPOLIS, IND.

[Lat., 39° 46′ N.; Long., 86° 10′ W.]

Jan ..	29.22	1.24	30.2	35.6	34.2	58	10	40.6	27.9	24	27	80	73	2.52	0.52
Feb ..	29.32	1.29	22.3	29.8	27.0	64	— 1	34.9	19.0	17	21	80	71	1.29	0.64
Mar ..	29.18	.70	38.1	47.0	44.4	71	22	53.1	35.6	30	32	74	59	2.15	1.01
Apr ..	29.20	.89	48.2	57.1	53.8	80	23	63.6	43.9	35	36	63	48	2.07	1.14
May .	29.16	.54	56.4	63.9	61.6	90	35	71.2	51.9	45	47	68	57	5.76	2.13
June .	29.20	.65	64.1	70.4	67.8	89	41	76.5	59.1	57	58	78	66	4.88	2.44
July .	29.18	.48	70.6	76.5	74.2	92	57	83.5	64.9	62	62	76	64	5.98	1.27
Aug ..	29.30	.39	66.3	75.0	71.4	91	51	82.0	60.7	56	58	70	56	0.54	0.28
Sept .	29.24	.72	58.9	65.9	64.5	90	39	74.2	54.8	52	52	78	61	3.79	1.05
Oct ..	29.30	.76	44.1	52.8	50.8	80	29	59.8	41.8	37	37	76	57	1.70	0.98
Nov ..	20.26	1.05	37.8	41.5	40.9	67	12	46.5	35.3	32	33	81	73	4.97	1.69
Dec ..	29.30	.90	42.9	47.8	46.7	68	24	55.5	38.0	37	40	81	74	2.76	1.37
Year .	29.24	.80	48.3	55.3	53.1	92	— 1	61.8	44.4	40	42	75	63	38.41	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

HELENA, MONT.

[H=4,060. T=64. h=51.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles). Direction.		Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	3.3	3.6	36	W.	SW.	1	2	0	0	0	35	8	7	9	17	10	4	5	20	31	0	0	0
Feb ..	4.8	7.0	38	W.	NW.†	0	11	1	1	1	14	13	14	1	10	6	12	6	11	24	0	0	0
Mar ..	4.4	5.3	29	NE.	SW.	2	7	1	3	1	30	4	9	5	15	7	9	7	2	21	0	0	0
Apr ..	4.5	6.3	42	NW.	SW.	1	5	3	2	1	20	15	7	6	12	11	7	4	0	3	0	1	0
May ..	4.6	6.0	36	NW.	SW.	5	6	0	4	0	21	6	9	11	17	5	9	12	0	1	0	3	0
June ..	3.6	7.0	34	NE.	SW.	2	7	1	1	0	19	5	9	16	17	9	4	4	0	0	0	0	0
July ..	2.5	5.4	32	SW.	NW.	2	13	1	2	1	11	7	17	8	20	11	0	7	0	0	1	4	0
Aug ..	1.3	5.3	36	NW.	NW.	0	0	1	3	1	16	11	22	8	27	3	1	2	0	0	2	1	0
Sept ..	2.8	6.8	30	SW.	SW.	2	2	0	0	0	19	16	12	9	19	8	3	3	0	2	0	0	0
Oct ..	4.5	6.0	34	W.	SW.	1	1	0	5	3	33	13	4	2	13	9	9	3	0	2	0	0	0
Nov ..	3.9	4.6	30	SW.	SW.	0	4	0	0	3	32	7	3	11	17	7	6	7	5	25	0	1	0
Dec ..	3.5	3.2	24	SW.	SW.	4	4	0	0	1	21	5	19	8	17	12	2	4	18	31	0	0	0
Year .	3.6	5.4	..	.....	SW.	20	62	8	21	12	271	110	132	94	201	98	66	64	56	140	3	10	0

HURON, S. DAK.

[H=1,307. T=47. h=39.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	4.6	9.4	42	NW.	NW.	12	3	2	7	12	1	2	22	1	11	9	11	9	20	31	0	0	0
Feb ..	4.6	10.7	60	NW.	NW.	6	3	1	15	3	2	3	21	2	12	8	8	9	20	28	0	0	0
Mar ..	3.6	9.4	38	NW.	NW.	15	4	1	14	4	2	4	16	2	14	9	8	4	4	29	0	0	0
Apr ..	5.2	13.1	60	NW.	SE.	13	6	0	16	6	4	0	15	0	8	10	12	7	0	9	0	1	0
May ..	4.5	11.0	48	SE.	NW.	15	10	1	9	5	3	3	16	0	5	20	6	10	0	2	0	5	0
June ..	4.2	10.0	39	S.	SE.	12	7	3	20	4	2	0	9	3	8	18	4	7	0	0	4	3	0
July ..	5.7	10.0	45	SE.	SE.	13	5	3	16	10	3	2	8	2	7	17	7	11	0	0	4	5	0
Aug ..	3.6	10.6	42	S.	S.	11	6	1	3	26	5	0	5	5	17	12	2	6	0	0	11	3	0
Sept ..	4.6	12.7	42	S.	NW.	7	0	2	15	8	5	2	20	1	10	13	7	10	0	0	1	5	0
Oct ..	4.5	10.7	33	SE.	SE.	8	5	1	25	7	3	0	12	1	16	7	8	9	0	10	0	0	0
Nov ..	3.9	10.5	36	NW.	NW.	8	1	1	17	8	3	4	18	0	13	12	5	4	10	29	0	0	4
Dec ..	5.0	10.2	44	NW.	SE.	10	1	3	25	1	1	3	18	0	12	8	11	6	11	31	0	0	0
Year .	4.5	10.7	..	.....	SE.	130	51	19	182	94	34	23	180	17	133	143	89	92	65	169	20	22	4

INDIANAPOLIS, IND.

[H=766. T=76. h=72.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	5.8	6.8	26	W.	SW.	8	4	2	12	6	14	10	6	0	9	6	16	11	4	20	0	1	0
Feb ..	4.7	7.0	26	NW.	W.	3	4	5	2	8	10	14	10	0	6	8	14	13	11	24	0	0	0
Mar ..	4.8	6.1	24	N.	NW.	10	7	4	6	3	7	6	17	2	6	14	11	8	1	8	0	1	0
Apr ..	4.7	6.6	26	W.†	E.	9	7	12	7	2	7	6	9	1	6	10	14	9	0	1	0	3	0
May ..	6.2	6.5	28	W.	S.	15	3	2	1	17	9	6	9	0	6	9	16	15	0	0	0	6	0
June ..	5.8	4.1	20	NW.	SW.	2	4	7	5	9	17	6	7	3	1	12	17	12	0	0	0	7	0
July ..	6.3	3.3	27	NW.	S.	5	7	7	5	13	7	1	10	7	6	11	14	14	0	0	3	6	0
Aug ..	4.5	3.6	16	NW.	NE.	10	13	9	3	5	9	5	3	5	16	9	6	6	0	0	1	2	0
Sept ..	4.9	4.7	24	NW.	S.	8	4	5	7	15	6	6	6	3	13	8	9	9	0	0	1	2	0
Oct ..	4.9	5.1	22	NW.	N.	18	12	3	6	5	8	3	3	4	13	9	9	5	0	3	0	1	0
Nov ..	7.3	6.1	22	W.	W.	5	4	6	8	7	8	16	6	0	6	5	19	18	2	10	0	0	0
Dec ..	6.2	6.6	26	W.	SE.†	1	2	2	15	15	12	7	8	0	7	12	12	13	0	5	0	2	0
Year .	5.5	5.5	..	.....	SW.	94	71	64	77	105	114	86	94	25	95	113	157	133	18	71	5	31	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

JACKSONVILLE, FLA.

[Lat., 30° 20′ N.; Long., 81° 39′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	30.04	.65	52.1	55.5	55.2	74	31	63.6	46.8	47	51	83	86	5.89	1.99
Feb ..	30.16	.68	47.8	52.9	52.4	81	31	60.2	44.5	42	49	79	86	3.85	.93
Mar ..	29.94	.87	54.1	60.1	59.1	81	39	68.4	49.8	46	56	74	87	1.38	.39
Apr ..	29.98	.58	63.5	67.6	67.8	88	44	78.3	57.3	55	63	75	85	3.95	3.52
May .	30.00	.51	70.8	74.6	74.6	94	50	85.9	63.2	61	66	72	76	.51	.36
June .	30.04	.68	76.3	76.2	78.2	95	54	86.5	70.0	69	72	80	88	6.89	1.83
July .	30.02	.28	79.6	75.4	81.9	97	70	89.7	74.1	72	74	79	85	8.24	1.46
Aug ..	30.06	.24	77.4	77.4	79.7	94	64	87.9	71.5	71	74	81	88	5.25	1.82
Sept .	29.99	.45	74.6	76.4	78.1	95	57	86.3	69.9	68	71	79	82	8.49	4.39
Oct ..	30.04	.44	61.5	67.2	67.3	90	45	77.9	56.7	56	63	82	87	1.26	1.26
Nov ..	30.10	.71	59.0	63.2	63.9	86	30	73.0	54.8	55	57	86	82	.51	.46
Dec ..	30.23	.37	54.2	61.6	62.0	80	35	72.7	51.4	52	58	93	89	T.	T.
Year .	30.05	.54	64.2	67.3	68.4	97	30	77.5	59.2	58	63	80	85	46.22	.....

JUPITER, FLA.

[Lat., 26° 57′ N.; Long., 80° 7′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	30.04	.46	65.4	67.4	66.7	82	40	73.2	60.2	61	63	86	85	9.84	6.38
Feb ..	30.12	.49	63.8	64.8	64.8	82	45	71.9	57.6	59	60	84	85	4.16	1.24
Mar ..	29.96	.67	62.6	66.1	64.8	78	49	72.5	57.0	57	59	82	79	2.00	.86
Apr ..	30.00	.37	70.2	70.6	70.6	84	52	77.5	63.6	64	64	81	79	2.33	1.00
May .	30.01	.36	75.8	75.5	75.4	89	56	83.8	66.9	67	67	74	76	3.45	1.90
June .	30.06	.27	79.8	78.5	78.8	92	64	85.0	72.5	74	73	83	85	9.80	1.95
July .	30.07	.22	82.5	80.2	81.5	95	72	87.7	75.2	76	74	80	83	4.00	1.10
Aug ..	30.06	.28	81.0	79.4	79.9	90	68	86.1	73.7	75	74	83	85	7.85	1.65
Sept ..	29.98	.35	80.8	80.1	79.8	90	71	85.2	74.5	75	74	82	82	6.15	1.35
Oct ..	30.01	.33	73.0	75.2	73.8	86	54	80.5	67.1	65	65	76	71	3.05	2.35
Nov ..	30.09	.37	71.7	73.1	73.2	87	46	79.4	67.1	65	66	80	78	2.47	1.10
Dec ..	30.20	.20	69.1	71.2	70.5	79	55	76.2	64.8	61	62	76	74	.36	.30
Year .	30.05	.36	73.0	73.5	73.3	95	40	79.9	66.7	67	67	81	80	55.46	.....

KANSAS CITY, MO.

[Lat., 39° 5′ N.; Long., 94° 37′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.06	1.07	26.5	33.6	31.2	52	4	38.8	23.7	20	26	76	74	1.05	.67
Feb ..	29.16	1.28	23.1	31.8	28.5	65	— 4	36.6	20.4	16	24	75	74	1.91	.94
Mar ..	29.05	.87	38.9	49.4	45.4	71	22	54.4	36.5	31	36	76	63	1.61	.97
Apr ..	29.03	.92	49.1	60.2	55.5	87	33	65.0	46.0	42	48	78	66	2.80	.67
May .	28.96	.72	57.9	68.0	63.3	85	39	72.5	54.1	52	56	82	68	8.98	3.24
June .	29.07	.81	64.9	74.7	70.8	89	50	80.1	61.4	60	64	84	70	3.11	1.07
July .	28.98	.41	70.9	80.5	77.0	92	60	85.7	68.3	66	70	86	72	3.06	.90
Aug ..	29.08	.34	67.0	78.2	74.3	91	60	83.5	65.1	62	67	84	70	4.64	1.84
Sept .	29.04	.69	58.3	67.5	64.6	89	40	73.4	55.9	54	61	85	79	7.08	1.95
Oct ..	29.13	.72	48.0	57.4	54.8	86	32	63.0	46.6	42	43	80	61	1.57	.89
Nov ..	29.14	1.05	33.9	43.1	40.0	67	10	47.9	32.0	27	30	77	63	2.38	1.37
Dec ..	29.06	1.16	40.7	48.9	46.4	70	12	54.7	38.2	35	41	80	76	.14	.14
Year .	29.06	.84	48.3	57.8	54.3	92	— 4	63.0	45.7	42	47	80	70	38.33	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

JACKSONVILLE, FLA.

[H=43. T=69. h=56]

Month and year.	Mean cloudiness (in tenths).	Wind.														Number of days.								
		Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan	6.0	7.4	35	SE.	N.	14	12	3	4	5	3	10	6	5	7	8	16	14	0	1	0	1	0
Feb	7.2	5.8	28	NE.	NE.†	11	11	1	4	4	7	5	6	7	3	7	18	13	0	1	0	0	0
Mar	3.6	6.1	28	NW†	W.	7	9	3	3	3	6	14	10	7	16	6	9	8	0	0	0	0	0
Apr	2.6	5.4	33	NW.	W.	3	8	4	6	5	7	13	5	9	18	5	7	5	0	0	0	1	0
May	1.7	5.7	24	S.†	W.	6	5	6	7	7	3	15	9	4	21	7	3	3	0	0	7	2	0
June	5.0	7.1	28	SE.	SE.	5	2	6	23	5	7	6	5	1	7	7	16	13	0	0	7	4	0
July	5.9	7.1	28	S.	SW.	1	2	1	13	8	30	7	0	0	7	13	11	16	0	0	15	2	0
Aug	6.5	5.6	25	NW.	SE.	5	12	7	15	8	8	2	3	2	5	10	16	16	0	0	9	3	0
Sept	3.7	5.3	32	S.	E.	7	11	14	10	6	5	5	2	0	18	5	7	10	0	0	7	1	0
Oct	1.6	5.6	23	W.	N,	15	13	7	5	3	3	7	7	2	27	4	0	1	0	0	1	0	0
Nov	3.5	6.9	30	W.	N.	14	10	1	7	4	5	7	11	1	16	13	1	3	0	1	0	0	0
Dec	3.5	4.1	22	N.	N.	15	9	7	3	3	4	8	5	8	20	9	2	0	0	0	0	0	0
Year	4.2	6.0	..	......	NE.	103	104	60	100	61	88	99	69	46	165	94	106	102	0	3	46	14	0

JUPITER, FLA.

[H=28. T=13. h=1.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	6.2	10.4	28	NE.	NW.	2	8	3	8	12	4	8	17	0	10	6	15	14	0	0	0	0	0
Feb	4.6	9.4	24	N.†	NW.	7	9	7	8	7	1	3	14	0	13	8	7	11	0	0	0	0	0
Mar	3.4	9.0	24	S.†	W.	2	2	3	6	5	2	22	20	0	19	6	6	5	0	0	0	0	0
Apr	3.5	8.9	24	S.†	NW.	7	10	1	9	10	3	7	13	0	23	1	6	7	0	0	0	0	0
May	2.2	8.5	25	NW.	S.	9	9	3	6	12	4	8	11	0	21	7	3	5	0	0	0	0	0
June	5.6	10.0	35	S.	SE.	3	1	10	20	10	7	4	5	0	9	8	13	17	0	0	2	0	0
July	4.3	7.9	28	SE.	SE.	0	0	3	30	15	11	3	0	0	15	10	6	9	0	0	3	0	0
Aug	5.0	7.2	24	SE.	SE.	5	2	2	28	9	9	5	1	1	12	12	7	18	0	0	0	1	0
Sept	4.9	8.2	46	E.	NE.	1	18	17	10	4	1	1	3	5	13	8	9	14	0	0	0	0	0
Oct	3.2	8.5	24	NE.	NE.	9	21	9	5	2	3	0	12	1	21	7	3	4	0	0	0	0	0
Nov	5.1	8.7	26	SE.	NE.	2	11	9	7	9	4	0	11	7	9	16	5	7	0	0	0	0	0
Dec	4.9	9.2	25	E.	NE.	7	19	18	5	0	0	3	10	0	11	14	6	4	0	0	0	0	0
Year	4.4	8.8	..	......	SE.	54	110	85	142	95	49	64	117	14	176	103	86	115	0	0	5	1	0

KANSAS CITY, MO.

[H=947. T=86. h=77.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	4.0	7.2	25	N.	N.	15	2	5	10	10	5	3	9	3	14	4	13	7	6	26	0	0	0
Feb	4.6	8.4	32	N.	NW.†	10	8	3	6	6	7	4	12	0	10	4	14	7	11	21	0	0	0
Mar	5.0	7.2	35	SE.	NW.†	16	11	2	9	4	4	0	16	0	14	5	12	6	0	6	0	1	0
Apr	4.8	8.1	34	S.	NE	7	11	10	10	5	3	3	11	0	13	7	10	11	0	0	0	6	0
May	5.4	10.6	42	S.	S.	5	9	2	5	16	6	6	11	2	5	14	12	16	0	0	0	10	0
June	4.4	6.8	26	NW.	S.	1	1	2	12	19	10	1	11	3	9	13	8	9	0	0	0	6	0
July	5.7	7.0	24	SE.	SE.	5	6	3	16	10	4	6	9	3	8	11	12	12	0	0	6	3	0
Aug	4.6	7.3	32	S.	SE.	4	9	7	27	6	3	3	3	0	16	8	7	7	0	0	1	6	0
Sept	5.2	7.5	28	S.	SE.	5	0	4	18	12	5	4	11	1	11	8	11	14	0	0	0	2	0
Oct	5.1	6.8	26	SW.	SE.	7	8	10	15	3	4	0	13	2	14	5	12	6	0	0	0	4	0
Nov	4.7	6.7	24	S.	NW.	11	7	2	7	7	3	5	18	0	14	6	10	6	1	12	0	0	0
Dec	5.3	9.3	36	SE.	S.	7	3	2	13	19	8	4	6	0	9	10	12	1	1	4	0	1	0
Year	4.9	7.7	..	......	SE.	93	75	52	148	117	62	39	130	14	137	95	133	102	19	69	7	39	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

KEELER, CAL.

[Lat., 36° 35′ N.; Long., 117° 50′ W.]

Month and year.	Pressure.		Temperature.							Dew-point.		Relative humidity.		Precipitation.	
								Mean.							
	Mean.	Range.	8 a. m.	8 p. m.	Mean (max. and min.).	Maximum.	Minimum.	Maximum.	Minimum.	8 a. m.	8 p. m.	8 a. m.	8 p. m.	Total.	Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	26.35	.81	34.2	43.7	39.0	59	23	47.5	30.5	22	22	63	47	.04	.04
Feb ..	26.37	.92	39.7	54.7	46.9	72	21	58.4	35.4	20	19	46	28	T.	T.
Mar ..	26.28	.84	46.5	60.0	53.6	75	36	63.0	44.2	30	30	55	36	.52	.25
Apr ..	26.26	.56	53.6	70.2	62.4	86	40	73.2	51.5	33	36	48	31	.12	.12
May .	26.21	.53	59.3	75.9	68.8	96	36	80.6	57.0	32	37	37	26	.06	.06
June .	26.22	.34	69.8	87.9	78.9	97	63	91.0	66.8	39	46	33	25	.01	.01
July .	26.24	.36	73.1	93.4	83.8	107	65	97.3	70.2	38	46	28	20	.00	.....
Aug ..	26.25	.37	72.9	91.1	82.7	101	64	95.2	70.2	41	47	32	23	T.	T.
Sept .	26.32	.53	64.8	83.1	74.9	97	50	86.8	63.0	39	41	41	25	.08	.08
Oct ..	26.34	.46	54.7	66.1	61.6	91	41	71.3	51.9	36	38	49	38	.56	.41
Nov ..	26.42	.53	45.0	54.2	50.2	71	33	59.6	40.7	27	27	48	37	.05	.05
Dec ..	26.26	.66	42.0	47.4	44.8	62	23	52.2	37.5	31	32	65	56	.56	.18
Year .	26.29	.58	54.6	69.0	62.3	107	21	73.0	51.6	32	35	45	33	2.00	.....

KEOKUK, IOWA.

[Lat., 40° 22′ N.; Long., 91° 26′ W.]

Month and year.	Pressure Mean.	Range.	8 a. m.	8 p. m.	Mean (max. and min.).	Maximum.	Minimum.	Mean Maximum.	Mean Minimum.	Dew-point 8 a. m.	Dew-point 8 p. m.	Rel. hum. 8 a. m.	Rel. hum. 8 p. m.	Total.	Max. in 24 hours.
Jan ..	29.40	.97	23.7	30.4	28.2	62	1	35.7	20.6	20	24	85	79	1.89	1.15
Feb ..	29.52	1.36	18.1	26.9	24.6	62	— 8	33.8	15.5	13	19	82	73	0.90	0.35
Mar ..	29.39	.71	35.7	46.6	43.0	68	21	51.9	34.0	29	31	77	59	1.04	0.72
Apr ..	29.37	.91	46.6	57.7	53.9	80	28	63.8	44.0	37	41	70	56	3.60	1.75
May .	29.31	.62	57.0	64.4	61.8	86	38	70.9	52.8	48	50	72	62	5.72	2.87
June .	29.34	.75	63.1	71.2	68.3	89	43	77.2	59.4	58	60	82	70	2.97	1.80
July .	29.32	.49	70.2	78.6	75.2	91	54	84.2	66.3	64	66	81	67	6.78	3.86
Aug ..	29.42	.43	65.4	77.0	73.2	93	55	83.7	62.6	58	62	77	62	0.95	0.45
Sept .	29.38	.64	56.0	65.6	64.0	87	33	73.2	54.8	52	55	82	70	5.14	2.27
Oct ..	29.50	.73	43.7	52.5	50.8	80	31	60.0	41.6	39	43	84	72	2.88	0.96
Nov ..	29.48	1.02	32.4	39.1	37.6	58	8	44.6	30.5	28	32	86	76	1.80	0.85
Dec ..	29.44	1.04	38.1	45.3	42.7	69	10	50.5	34.9	34	39	84	79	1.08	0.86
Year .	29.41	.81	46.0	54.6	51.9	93	— 8	60.8	43.1	40	44	80	69	34.75	.....

KEY WEST, FLA.

[Lat., 24° 34′ N.; Long., 81° 49′ W.]

Month and year.	Pressure Mean.	Range.	8 a. m.	8 p. m.	Mean (max. and min.).	Maximum.	Minimum.	Mean Maximum.	Mean Minimum.	Dew-point 8 a. m.	Dew-point 8 p. m.	Rel. hum. 8 a. m.	Rel. hum. 8 p. m.	Total.	Max. in 24 hours.
Jan ..	30.06	.38	70.1	70.5	70.0	79	54	74.0	65.9	67	67	89	88	2.42	.96
Feb ..	30.12	.36	69.1	69.8	69.4	82	57	73.8	65.1	64	66	85	86	1.05	.43
Mar ..	30.00	.54	69.6	69.8	69.4	79	60	73.4	65.4	60	62	73	76	6.89	2.79
Apr ..	30.02	.30	75.0	74.4	74.1	82	65	77.9	70.3	66	65	75	74	1.15	.86
May .	30.02	.30	78.6	78.3	77.8	86	66	81.9	73.6	68	68	70	71	1.08	.59
June .	30.04	.22	82.6	81.5	80.8	89	71	85.4	76.2	74	74	75	79	6.48	2.72
July .	30.06	.16	84.5	83.3	83.2	89	71	87.6	78.8	74	74	72	75	1.51	.38
Aug ..	30.04	.24	83.1	82.4	81.2	89	70	86.6	75.7	75	75	76	78	9.40	2.11
Sept .	29.96	.32	82.7	81.8	81.4	89	71	86.4	76.4	75	76	79	82	13.87	7.90
Oct ..	30.02	.27	77.4	78.1	76.8	87	66	80.7	73.0	68	68	73	71	3.16	1.54
Nov ..	30.08	.33	76.2	76.4	76.0	86	60	79.9	72.1	68	68	77	77	5.38	4.52
Dec ..	30.19	.18	70.9	72.1	71.3	79	63	74.2	68.4	66	66	85	82	0.23	.15
Year .	30.05	.30	76.6	76.5	76.0	89	54	80.2	71.7	69	69	77	78	52.67	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

KEELER, CAL.

[H=3,622. T=20. h=20.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
1889.																							
Jan ..	2.6	5.1	47	NW.	NW.†	10	4	7	10	3	3	4	10	11	19	6	6	1	0	20	0	0	0
Feb ..	1.7	6.9	42	N.	SE.	11	5	7	12	3	2	1	3	12	20	6	2	0	0	5	0	0	0
Mar ..	3.5	8.3	45	NW.	S.†	12	3	4	9	12	9	4	7	2	14	14	3	5	0	0	0	0	0
Apr ..	2.4	7.2	42	NW.	SW.	3	2	10	6	10	14	4	8	3	21	6	3	1	0	0	0	0	0
May .	2.4	9.1	36	NW.†	S.	7	0	11	7	18	8	2	8	1	19	10	2	1	0	0	7	0	0
June .	1.2	6.4	35	NW.	S.	6	3	11	9	16	11	2	1	1	25	5	0	1	0	0	17	2	0
July .	0.1	6.5	27	S.	S.	10	5	12	1	14	11	6	0	3	31	0	0	0	0	0	30	0	0
Aug ..	1.0	6.3	36	SE.	S.	6	4	11	5	20	9	1	0	6	27	3	1	0	0	0	2[illegible]	0	0
Sept .	1.4	5.9	30	NE.	S.	5	8	9	10	11	3	1	8	5	24	4	2	1	0	0	10	1	0
Oct ..	2.1	7.5	37	W.	SE.	10	4	4	14	13	2	0	8	7	22	5	4	6	0	0	1	1	0
Nov ..	2.0	6.0	48	N.	E.	6	4	18	13	2	1	1	3	12	23	4	3	1	0	0	0	0	0
Dec ..	3.8	8.7	36	SE.	SE.	9	4	10	15	12	3	1	4	4	14	11	6	8	0	6	0	0	0
Year .	2.0	7.0	...	......	S.	95	46	114	111	134	76	27	60	67	259	74	32	25	0	31	93	4	0

KEOKUK, IOWA.

[H=613. T=63. h=56.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
Jan ..	4.6	8.5	36	SW.	NW.	7	4	5	5	3	11	12	13	2	13	5	13	8	11	29	0	0	0
Feb ..	4.4	9.7	35	S.	NW.	8	5	9	2	3	5	7	16	1	8	12	8	8	11	26	0	1	0
Mar ..	4.6	7.7	26	SE.	NW.	7	12	3	6	1	6	5	18	4	11	12	8	3	0	10	0	1	0
Apr ..	4.2	9.5	42	SE.	NW.	7	8	10	9	4	5	3	11	3	8	14	8	8	0	2	0	5	0
May .	4.4	10.6	42	S.	S.	14	10	0	4	17	4	3	9	1	6	19	6	11	0	0	0	6	0
June .	4.0	6.2	28	SW.	SW.†	9	0	4	11	8	11	5	8	4	5	19	6	8	0	0	0	5	0
July .	4.0	6.9	26	SE.	SE.	11	5	5	13	10	4	2	9	3	9	19	3	11	0	0	1	9	0
Aug ..	2.3	6.2	24	SE.	SE.	7	1	3	19	10	7	4	7	4	18	11	2	5	0	0	2	4	0
Sept .	4.9	7.5	36	S.	SE.	6	3	4	11	11	9	6	10	0	9	14	7	16	0	0	0	1	0
Oct ..	3.9	4.7	24	W.	E.	7	3	12	7	6	2	5	9	11	15	9	7	7	0	1	0	1	0
Nov ..	4.4	6.3	28	W.	NW.	5	3	6	4	6	4	11	16	5	12	10	8	9	2	16	0	0	0
Dec ..	5.5	7.1	36	W.	SW.	4	2	2	8	11	12	10	8	5	10	7	14	7	1	8	0	2	0
Year .	4.3	7.6	...	......	NW.	92	56	63	99	90	80	73	134	43	124	151	90	101	25	92	3	35	0

KEY WEST, FLA.

[H=22. T=41. h=40.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
Jan ..	6.0	9.4	48	NW.	SE.	10	12	11	13	5	0	0	5	6	3	17	11	13	0	0	0	2	0
Feb ..	4.8	11.0	30	N.	E.	14	9	20	7	3	0	0	3	0	7	13	8	7	0	0	0	0	0
Mar ..	3.8	10.8	36	NW.	E.†	13	5	13	7	1	0	3	12	8	15	9	7	11	0	0	0	4	0
Apr ..	4.0	9.2	45	NW.	N.	17	11	15	3	2	1	3	5	3	12	11	7	3	0	0	0	2	0
May .	3.5	8.1	36	N.	E.	15	5	23	8	1	0	1	5	4	14	13	4	6	0	0	0	1	0
June .	5.6	8.2	26	E.	E.	5	1	24	16	7	2	2	2	1	6	13	11	11	0	0	0	5	0
July .	6.1	7.6	20	E.	E.	1	5	31	12	7	3	1	2	0	5	17	9	12	0	0	0	10	0
Aug ..	6.9	5.5	30	S.	E.	2	3	26	19	4	0	2	1	5	1	20	10	23	0	0	0	17	0
Sept .	5.6	7.7	60	E.	E.	5	5	34	8	4	0	0	1	3	9	14	7	19	0	0	9	4	0
Oct ..	3.8	9.3	30	NE.	E.	13	16	20	2	1	1	1	1	7	16	10	5	9	0	0	0	2	0
Nov ..	5.3	12.0	36	N.	E.	9	17	22	2	4	3	2	1	0	9	12	9	8	0	0	0	0	0
Dec ..	3.0	11.9	25	NE.	E.†	6	28	28	0	0	0	0	0	0	17	11	3	5	0	0	0	0	0
Year .	4.9	9.2	...	......	E.	110	117	267	97	39	10	15	38	37	114	160	91	127	0	0	0	47	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

KNOXVILLE, TENN.

[Lat., 35° 56′ N.; Long., 83° 58′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	29.06	1.01	34.7	42.5	40.8	65	20	49.0	32.7	31	33	89	70	3.88	.87
Feb ..	29.16	.98	33.0	40.9	38.8	64	12	46.9	30.6	27	26	79	57	5.82	2.71
Mar ..	28.97	.88	41.5	52.1	48.6	77	26	57.8	39.4	35	34	79	53	2.08	.72
Apr ..	29.00	.77	53.0	63.2	59.6	83	32	70.6	48.6	43	41	70	48	1.92	.62
May .	29.02	.63	58.5	68.3	64.4	91	36	76.3	52.5	52	50	80	55	4.08	2.07
June .	29.07	.48	65.7	71.7	70.7	88	44	80.1	61.3	61	63	87	75	5.57	1.04
July .	29.02	.42	72.7	78.8	77.2	92	60	86.1	68.3	68	68	85	70	2.85	.72
Aug ..	29.11	.34	67.1	74.2	73.2	86	56	82.4	64.0	64	67	92	79	6.42	1.72
Sept .	29.06	.65	61.2	68.4	67.5	89	40	77.1	57.9	58	60	89	76	5.74	2.77
Oct ..	29.09	.60	47.7	57.5	55.4	80	30	65.8	45.1	43	46	85	67	1.81	.91
Nov ..	29.10	.96	43.1	48.7	47.8	74	21	55.1	40.6	37	40	82	74	6.58	3.07
Dec ..	29.20	.61	47.8	55.7	54.1	72	22	62.7	45.5	44	46	86	71	.98	.52
Year .	29.07	.69	52.2	60.2	58.2	92	12	67.5	48.9	47	48	84	66	47.73	.....

LA CROSSE, WIS.

[Lat., 43° 49′ N.; Long., 91° 15′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.24	1.33	16.0	23.5	20.4	45	— 7	28.0	12.7	13	18	87	78	1.45	0.53
Feb ..	29.35	1.58	7.1	16.2	12.0	43	—23	20.3	3.6	4	10	88	77	0.93	0.46
Mar ..	29.24	.71	31.5	43.2	39.0	67	19	49.1	29.0	26	28	81	58	0.76	0.55
Apr ..	29.23	.88	41.3	54.4	49.0	81	24	59.6	38.5	32	33	70	48	1.51	0.64
May .	29.16	.76	50.9	62.1	57.0	83	34	66.9	47.2	42	43	73	52	2.30	0.75
June .	29.20	.73	58.8	69.0	64.4	88	42	73.7	55.1	52	55	80	62	3.31	1.86
July .	29.18	.56	64.8	75.8	72.0	92	49	81.9	62.0	60	61	84	62	2.72	0.99
Aug ..	29.26	.51	62.0	74.5	70.2	91	46	80.7	59.8	56	62	83	65	4.64	4.25
Sept .	29.21	.68	52.7	63.5	60.6	90	30	71.1	50.1	48	54	85	73	2.76	1.24
Oct ..	29.40	.79	36.5	48.9	45.2	79	24	55.8	34.6	32	34	86	59	0.06	0.05
Nov ..	29.33	.99	26.2	33.7	32.0	57	5	40.3	23.8	22	25	84	72	1.98	0.86
Dec ..	29.24	1.08	29.9	35.6	33.8	61	7	41.0	26.6	25	27	83	74	1.95	0.52
Year .	29.25	.88	39.8	50.0	46.3	92	—23	55.7	36.9	34	38	82	65	24.37	.....

LANSING, MICH.

[Lat., 42° 44′ N.; Long., 84° 32′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.04	1.53	24.8	28.4	27.6	51	6	34.1	21.1	23	26	94	92	1.93	0.71
Feb ..	29.14	1.39	13.7	19.3	17.2	43	—11	25.0	9.5	12	17	93	93	1.25	0.38
Mar ..	29.06	.78	30.9	37.2	37.0	65	11	45.8	28.3	27	32	88	83	1.13	0.79
Apr ..	29.08	.98	41.8	47.3	46.0	75	20	56.0	36.0	37	38	85	72	1.82	0.94
May .	29.02	.66	52.7	58.9	56.4	89	29	66.6	46.1	46	48	80	70	3.63	1.33
June .	29.06	.78	59.7	64.7	62.6	87	40	72.3	53.0	56	57	87	78	4.14	0.89
July .	29.06	.57	67.6	72.9	70.4	93	49	82.4	58.5	61	61	80	67	2.62	1.27
Aug ..	29.16	.52	63.6	70.4	68.4	93	45	81.4	55.5	56	55	78	60	0.79	0.54
Sept .	29.10	.75	56.4	62.0	61.4	90	29	73.4	49.4	52	50	86	66	0.85	0.32
Oct ..	29.20	.88	39.2	44.8	44.4	74	21	53.6	35.3	35	35	87	71	0.79	0.40
Nov ..	29.10	1.16	35.2	37.1	37.5	57	13	42.6	32.4	33	34	92	89	2.51	0.74
Dec ..	29.13	1.10	33.8	36.7	37.0	62	15	43.6	30.4	30	32	88	85	2.75	0.43
Year .	29.10	.92	43.3	48.3	47.2	93	—11	56.4	38.0	39	40	86	77	24.21	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

KNOXVILLE, TENN.

[H=980. T=80. h=71.]

Month and year.	Mean cloudiness (in tenths).	Wind: Average hourly vel. (miles).	Wind: Maximum (miles).	Wind: Direction.	Wind: Prevailing direction.	Wind: North.	Wind: Northeast.	Wind: East.	Wind: Southeast.	Wind: South.	Wind: Southwest.	Wind: West.	Wind: Northwest.	Wind: Calms.	Number of days: Cloudless.	Number of days: Partly cloudy.	Number of days: Cloudy.	Number of days: Rainy.	Number of days: Max. below 32°.	Number of days: Min. below 32°.	Number of days: Max. above 90°.	Number of days: Thunder storms.	Number of days: Auroras.
1889.																							
Jan ..	5.1	5.1	40	W.	E.	7	11	15	1	1	5	14	1	7	9	9	13	13	2	17	0	0	0
Feb ..	6.0	6.4	26	W.	W.	7	7	10	1	4	10	14	3	0	4	11	13	7	3	15	0	2	0
Mar ..	4.0	5.6	30	W.	NE.	12	16	8	4	0	8	9	4	1	8	13	10	9	0	3	0	2	0
Apr ..	4.2	7.0	26	SW.	W.	10	10	8	6	0	10	11	5	0	14	11	5	10	0	0	0	2	0
May .	3.7	5.0	36	W.†	W.	4	5	9	4	1	13	19	6	1	15	11	5	9	0	0	1	2	0
June .	6.1	4.3	28	W.	SW.	3	7	13	4	3	15	8	2	5	4	18	8	17	0	0	0	5	0
July .	5.5	4.7	28	W.	SW.	5	6	7	4	5	19	8	6	2	7	16	8	14	0	0	3	4	0
Aug ..	5.4	3.7	29	SW.	NE.	6	14	12	5	4	12	4	2	3	9	12	10	13	0	0	0	2	0
Sept .	4.2	3.8	36	SW.	NE.	8	16	11	2	1	3	4	4	11	17	3	10	11	0	0	0	0	0
Oct ..	4.0	4.9	20	N.	NE.	15	18	10	2	2	2	3	4	6	15	9	7	7	0	1	0	1	0
Nov ..	6.4	6.4	36	W.	NE.	8	14	2	3	3	11	13	2	4	7	9	14	16	1	3	0	0	0
Dec ..	5.2	5.5	24	SW.	SW.	6	9	6	1	2	21	9	0	8	11	9	11	8	0	2	0	0	0
Year .	5.0	5.2	..	.....	NE.	91	133	111	37	26	129	116	39	48	120	131	114	134	6	41	4	20	0

LA CROSSE, WIS.

[H=744. T=79. h=71.]

Month and year.	Mean cloudiness (in tenths).	Wind: Average hourly vel. (miles).	Wind: Maximum (miles).	Wind: Direction.	Wind: Prevailing direction.	Wind: North.	Wind: Northeast.	Wind: East.	Wind: Southeast.	Wind: South.	Wind: Southwest.	Wind: West.	Wind: Northwest.	Wind: Calms.	Number of days: Cloudless.	Number of days: Partly cloudy.	Number of days: Cloudy.	Number of days: Rainy.	Number of days: Max. below 32°.	Number of days: Min. below 32°.	Number of days: Max. above 90°.	Number of days: Thunder storms.	Number of days: Auroras.
Jan ..	5.4	7.4	32	NW.	S.	6	2	3	5	17	5	8	13	0	9	11	11	13	16	29	0	0	0
Feb ..	5.6	7.7	36	N.	NW.†	5	2	2	7	15	2	8	15	0	7	13	8	10	20	28	0	0	0
Mar ..	4.7	6.8	30	SW.	NW.	13	7	1	3	8	8	1	21	0	11	13	7	7	1	18	0	0	0
Apr ..	5.6	9.0	32	NW.	S.	10	6	6	5	14	4	4	9	2	7	10	13	7	0	6	0	1	0
May .	5.2	8.0	39	SW.	S.	8	7	5	2	16	3	2	15	4	6	19	6	11	0	0	0	4	0
June .	5.4	7.1	25	NW.	NW.	2	5	4	10	14	0	4	16	5	7	14	9	7	0	0	0	4	0
July .	4.4	6.8	32	S.	S.	11	2	3	8	22	6	3	7	0	10	18	3	12	0	0	4	5	0
Aug ..	4.5	6.8	25	S.	S.	6	0	2	1	37	3	3	6	4	13	11	7	6	0	0	2	4	0
Sept .	5.6	6.9	26	NW.	S.	2	1	2	5	25	7	3	11	4	8	12	10	11	0	1	0	2	0
Oct ..	4.3	5.0	28	NW.	S.	14	3	1	4	19	1	3	6	11	14	11	6	3	0	12	0	0	0
Nov ..	5.2	5.3	26	NW.	S.	7	4	0	1	16	2	6	12	12	13	7	10	9	4	25	0	0	0
Dec ..	5.7	6.6	40	NW.	S.	4	3	3	6	22	5	9	5	5	7	14	10	14	4	23	0	0	0
Year .	5.1	7.0	..	.....	S.	88	42	32	57	225	46	54	136	47	112	153	100	110	45	142	6	20	0

LANSING, MICH.

[H=883. T=44. h=42.]

Month and year.	Mean cloudiness (in tenths).	Wind: Average hourly vel. (miles).	Wind: Maximum (miles).	Wind: Direction.	Wind: Prevailing direction.	Wind: North.	Wind: Northeast.	Wind: East.	Wind: Southeast.	Wind: South.	Wind: Southwest.	Wind: West.	Wind: Northwest.	Wind: Calms.	Number of days: Cloudless.	Number of days: Partly cloudy.	Number of days: Cloudy.	Number of days: Rainy.	Number of days: Max. below 32°.	Number of days: Min. below 32°.	Number of days: Max. above 90°.	Number of days: Thunder storms.	Number of days: Auroras.
Jan ..	6.5	8.2	36	SW.	SW.	0	10	2	8	4	24	4	8	2	5	12	14	15	16	31	0	0	0
Feb ..	6.6	8.2	27	NW.	NW.	0	3	5	8	5	14	3	17	1	3	13	12	15	22	28	0	0	0
Mar ..	4.8	7.7	24	NW.	NW.	3	10	0	11	1	9	3	24	1	11	16	4	5	2	22	0	0	0
Apr ..	5.5	7.6	28	SW.	NW.†	3	12	2	7	7	11	3	12	3	11	10	9	8	0	9	0	2	0
May .	6.0	7.0	30	NE.	SW.	0	10	2	3	7	17	3	16	4	3	21	7	12	0	1	0	2	0
June .	7.3	5.4	24	SW.	SW.	0	7	2	11	3	19	5	9	4	1	17	12	14	0	0	0	3	0
July .	4.3	5.2	38	SW.	SW.	1	11	1	8	6	17	4	14	0	13	14	4	8	0	0	2	2	0
Aug ..	4.1	5.2	24	SW.	SW.	3	6	1	7	6	23	7	8	1	11	15	5	5	0	0	2	2	0
Sept .	4.4	6.4	28	SE.	SE.	1	5	2	15	14	10	3	8	2	13	13	4	8	0	1	1	2	0
Oct ..	6.3	6.6	24	NW.	NE.	11	12	1	6	4	11	7	7	3	7	9	15	7	0	12	0	1	0
Nov ..	7.4	7.3	28	SW.	SW.	3	10	1	5	4	21	2	11	3	4	9	17	19	3	11	0	0	0
Dec ..	6.5	7.8	40	SW.	SW.	0	7	2	11	5	18	6	6	7	8	8	15	16	8	16	0	0	0
Year .	5.8	6.9	..	.....	SW.	25	103	21	100	66	194	50	140	31	90	157	118	132	46	131	5	14	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

LEAVENWORTH, KANS.

[Lat., 39° 19′ N.; Long., 94° 57′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a.m.	Temperature. 8 p.m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a.m.	Dew-point. 8 p.m.	Relative humidity. 8 a.m.	Relative humidity. 8 p.m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan	29.19	1.06	24.0	31.3	29.8	52	4	37.5	22.0	19	26	83	81	1.06	0.68
Feb	29.30	1.33	21.2	29.7	27.5	66	− 5	36.2	18.8	16	23	81	77	2.56	1.21
Mar	29.17	.93	37.6	48.8	45.2	72	21	54.8	35.5	30	38	75	68	1.32	0.67
Apr	29.14	.97	47.9	59.9	55.4	89	30	66.0	44.9	40	43	75	57	2.80	0.72
May	29.07	.78	57.3	68.3	63.8	89	37	73.7	53.9	50	53	77	61	9.90	2.51
June	29.10	.85	64.5	75.3	70.6	91	49	80.7	60.4	56	60	76	60	3.01	1.02
July	29.09	.44	70.9	80.1	76.8	93	56	86.0	67.5	63	66	77	65	3.02	0.76
Aug	29.18	.37	66.5	77.6	74.0	92	55	84.4	63.7	60	66	79	67	7.09	3.38
Sept	29.15	.73	58.0	65.4	64.7	91	35	74.5	54.9	53	58	83	77	5.73	2.06
Oct	29.24	.73	47.3	55.2	54.2	87	28	63.4	45.0	40	45	78	69	1.59	0.77
Nov	29.26	1.05	32.4	39.9	39.2	67	10	48.1	30.3	26	30	80	70	2.77	1.74
Dec	29.18	1.25	38.1	46.6	45.3	73	11	54.5	36.1	33	37	82	72	0.08	0.02
Year	29.17	.87	47.1	56.5	53.9	93	− 5	63.3	44.4	40	45	79	69	40.93	.....

LEXINGTON, KY.

[Lat., 38° 2′ N.; Long., 84° 33′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a.m.	Temperature. 8 p.m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a.m.	Dew-point. 8 p.m.	Relative humidity. 8 a.m.	Relative humidity. 8 p.m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan	28.94	1.05	34.4	39.1	37.4	58	16	44.2	30.7	28	30	78	70	5.66	1.85
Feb	29.04	1.09	27.6	34.5	31.6	69	6	39.7	23.6	2[illegible]	24	78	68	1.78	0.60
Mar	28.88	.76	40.7	48.4	45.8	75	24	53.9	37.6	32	32	72	57	1.63	0.68
Apr	28.90	.83	50.9	58.1	55.0	82	24	64.6	45.5	40	40	70	53	1.54	0.43
May	28.90	.70	60.2	64.8	62.8	89	38	72.1	53.6	50	49	70	59	3.53	1.65
June	28.95	.52	66.2	70.1	69.2	88	43	77.1	61.3	59	61	79	74	3.49	0.91
July	28.92	.45	72.2	76.1	75.4	90	61	83.4	67.5	67	66	83	74	5.82	2.08
Aug	29.01	.32	68.7	74.3	72.1	89	57	81.1	63.1	61	62	78	66	1.15	0.53
Sept	28.97	.69	61.1	66.7	65.4	88	40	74.0	56.9	56	56	82	70	6.79	1.66
Oct	29.16	.71	47.5	54.8	52.3	74	29	60.9	43.7	41	42	79	65	3.06	1.52
Nov	28.96	1.00	40.8	43.8	43.0	73	15	49.7	36.2	35	36	83	75	5.34	1.59
Dec	29.04	.68	46.2	51.8	50.2	68	22	58.4	42.0	39	41	77	69	1.73	0.56
Year	28.97	.73	51.4	56.9	55.0	90	6	63.3	46.8	44	45	77	67	41.50	.....

LITTLE ROCK, ARK.

[Lat., 34° 45′ N.; Long., 92° 6′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a.m.	Temperature. 8 p.m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a.m.	Dew-point. 8 p.m.	Relative humidity. 8 a.m.	Relative humidity. 8 p.m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan	29.76	.84	37.7	45.7	43.6	66	20	51.4	35.7	34	38	87	75	7.30	3.54
Feb	29.86	.93	36.4	47.7	43.4	78	17	52.5	34.4	30	34	80	62	1.48	.94
Mar	29.68	1.00	46.8	58.4	54.3	79	31	64.0	44.6	39	40	76	55	6.17	1.98
Apr	29.68	.76	57.5	68.3	64.4	82	46	74.6	54.2	50	53	78	60	4.28	1.04
May	29.68	.56	63.3	72.4	67.8	88	44	77.1	58.4	56	58	78	61	2.97	.90
June	29.68	.55	69.6	76.3	73.6	91	51	82.1	65.0	64	66	83	71	3.07	.78
July	29.66	.35	75.3	82.0	80.4	95	65	88.9	71.9	72	72	88	72	7.59	3.64
Aug	29.74	.20	70.7	79.2	76.8	93	61	85.9	67.7	67	69	89	72	3.06	2.36
Sept	29.71	.70	64.6	73.0	70.8	91	50	79.4	62.1	61	65	89	78	5.96	1.66
Oct	29.78	.64	52.3	63.9	60.8	82	36	71.1	50.5	47	52	82	66	1.99	1.67
Nov	29.79	.97	42.2	49.1	47.0	73	25	53.9	40.1	38	41	86	74	10.20	3.47
Dec	29.82	.75	53.2	60.8	59.1	78	28	67.5	50.7	50	51	88	70	.14	.69
Year	29.74	.69	55.8	64.7	61.8	95	17	70.7	52.9	51	53	84	68	54.21	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

LEAVENWORTH, KANS.

[H=842. T=56. h=50.]

Month and year.	Mean cloudiness (in tenths).	Wind.													Number of days.								
		Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	4.0	6.5	26	NW.	NW.	7	5	1	10	9	6	2	20	2	12	10	9	7	8	29	0	0	0
Feb ..	4.8	7.4	34	NW.	NW.	12	4	2	7	6	3	1	20	1	10	9	9	7	11	21	0	1	0
Mar ..	4.7	6.4	30	S.	N.	20	6	4	6	8	1	2	13	2	12	15	4	6	0	8	0	1	0
Apr ..	4.7	6.9	30	S.	SE.	13	11	2	16	3	2	3	9	1	11	9	10	12	0	1	0	5	0
May .	5.3	8.5	36	S.	S.†	17	3	3	4	17	3	2	12	1	9	18	4	14	0	0	0	10	0
June .	4.0	5.2	28	S.	S.	11	2	2	12	23	1	2	6	1	14	11	5	8	0	0	1	6	0
July .	4.2	5.4	20	NW.	S.	9	9	3	9	18	2	2	10	0	13	10	8	11	0	0	8	8	0
Aug .	3.0	5.1	36	NW.	S.	6	4	0	15	26	0	1	6	4	20	7	4	11	0	0	2	6	0
Sept .	5.0	5.2	24	NW.	S.	12	0	1	7	22	0	1	5	12	10	11	9	14	0	0	1	1	0
Oct ..	4.9	4.2	24	NW.	N.	12	5	7	11	4	1	2	7	13	12	9	10	7	0	1	0	2	0
Nov ..	4.2	4.9	26	N.	NW.	13	5	5	3	7	1	5	15	6	14	6	10	5	2	17	0	0	0
Dec ..	5.5	6.3	36	S.	S.	5	4	2	8	14	5	3	9	12	9	11	11	5	1	8	0	0	0
Year .	4.5	6.0	..	......	S.	137	58	32	108	157	25	26	132	55	146	126	93	107	22	-5	12	40	0

LEXINGTON, KY.

[H=1,040. T=74. h=67.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	6.7	11.7	50	W.	SE.	0	12	0	18	4	10	4	14	0	9	4	18	12	2	19	0	0	0
Feb ..	6.8	13.1	48	W.	NW.	1	9	1	11	9	4	8	12	1	5	8	15	15	6	21	0	1	0
Mar ..	5.8	12.1	62	SW.	NW.	3	6	4	11	1	9	2	26	0	10	9	12	11	0	6	0	0	0
Apr .	5.0	12.9	60	SW.	NE.	2	19	1	4	7	5	4	16	2	10	9	11	10	0	2	0	2	0
May	5.7	10.4	60	NW.	NW.†	0	1	1	20	6	12	2	20	0	7	13	11	14	0	0	0	2	0
June .	6.6	9.3	48	SW.	SE.	0	6	2	21	5	11	2	13	0	3	12	15	16	0	0	0	4	0
July .	6.3	7.3	36	SW.	SE.	2	11	3	18	4	13	3	8	0	8	7	16	15	0	0	0	3	0
Aug ..	5.0	8.5	24	SW.	NE.	2	18	2	12	2	16	1	9	0	12	13	6	4	0	0	0	1	0
Sept .	4.9	9.3	50	NW.	SE.	1	17	0	19	2	8	2	11	0	14	7	9	12	0	0	0	2	0
Oct ..	6.1	10.4	36	SW.	SW.	8	11	5	7	2	17	2	10	0	10	8	13	8	0	2	0	2	0
Nov ..	7.5	13.0	40	W.	SW.	2	8	4	13	3	14	10	5	1	14	9	17	17	1	6	0	0	0
Dec ..	6.6	14.6	50	SW.	SE.	1	6	1	19	11	11	3	10	0	6	10	15	15	0	5	0	1	0
Year .	6.1	11.0	..	......	SE.	22	124	24	173	56	130	43	154	4	98	109	158	149	9	61	0	18	0

LITTLE ROCK, ARK:

[H=309. T=75. h=54.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	5.2	5.4	24	N.†	NW.	3	6	8	7	8	6	9	13	2	11	7	13	10	0	10	0	1	0
Feb ..	5.7	6.5	30	SW.	NE.	5	10	7	6	7	9	3	6	3	9	8	11	6	2	14	0	0	0
Mar ..	4.2	6.6	24	NW.†	NW.	10	8	2	8	4	7	3	16	4	12	13	6	9	0	1	0	1	0
Apr ..	4.0	6.1	24	SW.	NW.†	8	9	5	11	6	6	4	11	0	13	9	8	10	0	0	0	3	0
May .	2.6	5.8	24	NW.†	NW.	3	0	3	8	15	10	6	16	1	15	11	5	6	0	0	0	0	0
June .	4.8	5.0	24	SW.	NE.†	3	13	5	7	13	12	3	4	0	6	17	7	13	0	0	1	0	0
July .	5.5	4.4	35	E.	SW.	3	2	9	7	6	27	3	4	1	6	18	7	11	0	0	13	4	0
Aug ..	3.7	3.5	30	NW.	NE.	4	19	9	15	2	3	0	7	3	15	13	3	7	0	0	3	1	0
Sept .	5.5	4.2	20	S.	N.	13	8	5	7	8	4	3	9	3	7	15	8	13	0	0	2	2	0
Oct ..	2.8	5.2	24	NE.	NE.	9	15	5	5	8	4	8	8	0	20	9	2	3	0	0	0	1	0
Nov ..	5.5	6.5	24	NW.	W.	7	8	3	2	7	6	18	8	1	12	4	14	14	0	1	0	0	0
Dec ..	5.5	6.3	24	S.	S.	5	6	5	1	20	18	2	1	4	9	13	9	4	0	3	0	1	0
Year .	4.6	5.5	..	......	SW.	73	104	66	84	104	112	62	103	22	135	137	93	106	2	29	19	14	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

LOS ANGELES, CAL.

[Lat., 34° 3′ N.; Long., 118° 15′ W.]

Month and year.	Pressure.		Temperature.					Mean.		Dew-point.		Relative humidity.		Precipitation.	
	Mean.	Range.	8 a. m.	8 p. m.	Mean (max. and min.).	Maximum.	Minimum.	Maximum.	Minimum.	8 a. m.	8 p. m.	8 a. m.	8 p. m.	Total.	Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	29.67	.83	45.8	56.6	52.4	71	32	63.4	41.5	32	41	61	58	.25	.18
Feb ..	29.70	.64	48.2	61.3	56.4	84	33	68.9	43.9	33	41	59	50	.92	.81
Mar ..	29.64	.57	51.7	61.9	59.2	81	44	69.1	49.4	46	51	84	70	6.48	2.53
Apr ..	29.64	.40	53.1	64.7	62.2	93	46	73.0	51.3	49	53	87	68	.27	.15
May .	29.62	.25	53.4	64.3	62.6	94	46	73.3	51.9	49	50	86	62	.65	.35
June .	29.58	.21	57.7	67.5	66.4	81	51	76.1	56.6	55	56	90	67	.01	.01
July .	29.54	.26	60.1	73.7	70.8	99	54	83.2	58.5	57	58	89	60	T.	T.
Aug ..	29.54	.29	60.8	74.7	71.6	95	53	84.2	59.1	56	59	86	60	.28	.61
Sept .	29.58	.40	64.0	74.2	72.6	103	52	84.8	60.3	52	56	72	57	.34	.01
Oct ..	29.66	.31	58.5	66.2	66.3	89	50	76.2	56.4	52	55	81	69	6.96	3.62
Nov ..	29.71	.37	54.[illegible]	62.8	61.3	82	43	72.7	49.9	36	48	54	62	1.35	.73
Dec ..	29.70	.48	50.6	55.7	54.8	68	40	60.8	48.7	47	50	88	82	15.80	4.30
Year .	29.63	.42	54.8	65.3	63.0	103	32	73.8	52.3	47	52	78	64	33.31	....

LOUISVILLE, KY.

[Lat., 38° 15′ N.; Long., 84° 45′ W.]

Month and year.	Pressure: Mean.	Pressure: Range.	Temp. 8 a. m.	Temp. 8 p. m.	Mean (max. and min.).	Maximum.	Minimum.	Mean Maximum.	Mean Minimum.	Dew-point 8 a. m.	Dew-point 8 p. m.	Rel. hum. 8 a. m.	Rel. hum. 8 p. m.	Precip. Total.	Max. in 24 hours.
Jan ..	29.47	1.00	34.8	41.4	38.4	60	17	46.4	30.3	27	30	74	65	3.07	1.28
Feb ..	29.58	1.20	28.1	36.4	32.9	68	6	41.9	23.9	20	25	72	66	2.33	1.20
Mar ..	29.40	.78	42.5	51.9	48.2	76	24	58.4	37.9	33	40	69	64	.95	.34
Apr ..	29.42	.86	52.0	61.4	57.8	85	29	68.6	47.0	41	43	66	54	.65	.21
May .	29.41	.65	29.2	67.6	64.1	90	37	74.7	53.5	48	50	67	56	5.26	2.99
June .	29.45	.57	66.8	73.0	70.6	93	44	79.5	61.6	59	61	75	68	5.76	1.38
July .	29.42	.47	72.9	78.3	76.4	92	59	85.3	67.5	65	66	78	68	2.98	.98
Aug ..	29.52	.30	68.4	77.4	73.9	91	54	84.6	63.2	59	61	73	58	.23	.11
Sept .	29.48	.71	61.4	68.8	67.0	90	42	76.5	57.6	54	56	77	66	4.38	.83
Oct ..	29.54	.70	49.3	58.1	56.0	81	31	65.8	46.2	40	42	71	57	1.68	.64
Nov ..	29.52	1.03	41.5	45.7	44.8	76	17	52.3	37.4	34	36	77	69	5.99	1.26
Dec ..	29.58	.79	47.3	53.8	51.6	71	24	60.2	43.1	38	42	71	65	1.74	.90
Year .	29.48	.76	52.0	59.5	56.8	93	6	66.2	47.4	43	46	72	63	35.02	....

LYNCHBURGH, VA.

[Lat., 37° 25′ N.; Long., 79° 9′ W.]

Month and year.	Pressure: Mean.	Pressure: Range.	Temp. 8 a. m.	Temp. 8 p. m.	Mean (max. and min.).	Maximum.	Minimum.	Mean Maximum.	Mean Minimum.	Dew-point 8 a. m.	Dew-point 8 p. m.	Rel. hum. 8 a. m.	Rel. hum. 8 p. m.	Precip. Total.	Max. in 24 hours.
Jan ..	29.36	1.18	34.8	40.7	41.2	69	18	51.2	31.3	25	29	70	65	5.26	1.78
Feb ..	29.46	1.16	29.1	36.2	34.8	66	7	43.5	26.2	20	29	71	75	3.06	0.94
Mar ..	29.24	.98	40.8	48.4	46.7	77	28	56.2	37.2	34	38	78	67	2.44	1.18
Apr ..	29.28	.99	53.0	59.2	57.0	89	28	67.9	46.0	44	47	69	66	3.14	0.95
May .	29.30	.60	62.9	67.0	66.0	95	35	78.1	53.9	55	57	75	73	7.14	2.80
June .	29.38	.64	68.6	71.7	71.7	92	45	81.1	62.3	62	66	81	84	3.8[illegible]	0.98
July .	29.32	.48	73.2	75.7	76.2	96	59	85.1	67.4	67	68	82	80	10.94	3.21
Aug ..	29.42	.45	68.2	72.2	72.4	89	53	81.5	63.3	62	65	80	78	3.82	1.38
Sept .	29.36	.75	62.8	65.6	66.7	87	42	75.4	58.0	56	59	79	79	10.69	2.75
Oct ..	29.36	.73	48.6	54.0	54.4	81	33	64.0	44.9	40	44	76	72	4.90	1.94
Nov ..	29.40	1.14	44.2	48.1	48.2	73	24	56.1	40.3	37	38	77	71	4.86	1.60
Dec ..	29.50	.94	43.4	50.7	50.6	73	21	61.0	40.1	36	39	77	67	0.51	0.27
Year .	29.36	.84	52.5	57.5	57.2	96	7	66.8	47.6	45	48	76	73	60.58	....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

LOS ANGELES, CAL.

[H=330. T=74. h=66.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan	2.4	3.2	17	N.	W.	14	18	1	1	3	2	22	1	0	19	6	6	4	0	0	0	0	0
Feb	2.0	3.6	24	W.	W.	9	15	3	0	1	4	20	3	1	18	8	2	5	0	0	0	0	0
Mar	4.2	4.0	24	E.	W.	6	13	6	0	0	13	19	1	4	9	18	4	7	0	0	0	3	0
Apr	3.6	3.7	24	NW.	W.	11	7	5	0	0	11	19	4	3	12	13	5	4	0	0	1	0	0
May	3.4	4.1	23	W.	W.	5	5	2	3	1	8	28	5	5	9	19	3	3	0	0	1	1	0
June	4.5	3.7	14	SW.	W.	3	6	5	1	1	9	25	2	8	1	28	1	0	0	0	0	0	0
July	2.5	3.4	14	W.	W.	5	2	4	1	2	7	27	3	11	15	16	0	0	0	0	5	0	0
Aug	2.5	3.4	13	W.	W.	11	3	2	0	0	8	27	1	10	14	16	1	1	0	0	5	0	0
Sept	3.0	3.6	15	W.	W.	9	3	3	0	6	6	25	3	5	11	18	1	1	0	0	8	0	0
Oct	4.9	3.9	20	E.	W.	14	10	6	1	1	9	17	4	0	6	20	5	7	0	0	0	0	0
Nov	3.0	3.6	22	N.	N.	18	11	3	2	0	2	14	10	0	18	8	4	4	0	0	0	0	0
Dec	5.9	4.0	20	E.	NE.	8	15	13	4	5	1	8	5	3	8	11	12	20	0	0	0	0	0
Year	3.5	3.7	..	......	W.	113	108	53	13	20	80	251	42	50	140	181	44	56	0	0	20	4	0

LOUISVILLE, KY.

[H=551. T=100. h=103.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	6.2	8.4	40	SW.	W.	3	8	3	13	5	9	15	5	1	8	8	15	11	1	18	0	0	0
Feb	6.2	9.3	32	NW.	W.	3	9	3	7	8	8	15	3	0	4	12	12	12	6	22	0	0	0
Mar	4.9	7.9	40	SW.	N.	12	9	9	0	3	11	9	8	1	10	14	7	8	0	6	0	0	0
Apr	4.8	8.3	30	SW.	NE.	11	15	4	2	5	9	7	2	5	12	10	8	7	0	1	0	1	0
May	5.4	7.2	31	W.	SE.	7	4	3	15	6	11	8	7	1	13	10	8	14	0	0	0	4	0
June	6.0	6.0	26	SW.	SW.	5	9	4	9	8	15	4	2	4	8	14	8	18	0	0	1	5	0
July	5.7	4.8	31	SW.	NE.	8	14	0	12	3	12	3	7	3	10	7	14	16	0	0	4	3	0
Aug	3.8	5.1	30	SW.	N.	13	11	8	2	8	12	1	4	3	18	6	7	3	0	0	1	1	0
Sept	4.5	5.0	29	E.	SW.	7	7	7	6	6	9	7	5	6	15	5	10	11	0	0	0	0	0
Oct	3.5	5.8	27	W.	N.	16	9	3	2	5	3	7	6	11	21	2	8	6	0	1	0	0	0
Nov	6.7	7.9	32	W.	W.	7	7	5	5	4	12	13	1	6	7	5	18	15	1	4	0	0	0
Dec	6.1	7.3	32	W.	S.	4	5	3	5	15	13	6	2	9	8	8	15	10	0	2	0	1	0
Year	5.3	6.9	..	......	SW.	96	107	52	78	76	124	95	52	50	134	101	130	131	8	54	6	15	0

LYNCHBURGH, VA.

[H=658. T=67. h=57.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	4.6	4.9	36	E.	NW.	2	4	2	1	1	6	4	19	23	10	7	14	12	0	15	0	0	0
Feb	5.6	4.7	36	NW.	NW.	3	8	3	7	4	4	2	19	6	5	10	13	11	2	23	0	0	0
Mar	5.2	6.0	24	NW.†	NW.	1	8	2	6	6	3	3	17	16	4	16	11	11	0	8	0	0	0
Apr	5.2	6.9	34	NW.	NW.	3	9	2	8	7	3	4	15	9	5	15	10	13	0	1	0	1	0
May	5.4	4.2	26	NW.	NW.	4	5	1	5	1	3	7	11	25	3	14	14	14	0	0	4	4	0
June	6.4	4.2	22	NW.	NW.	4	6	4	6	7	5	5	9	14	0	18	12	19	0	0	2	4	0
July	6.8	3.1	30	NW.	S.	5	4	5	8	10	5	5	10	10	4	12	15	18	0	0	6	9	0
Aug	5.7	3.0	18	NE.	S.	8	8	4	6	9	6	1	7	13	8	12	11	12	0	0	0	5	0
Sept	5.2	4.1	23	NE.	N.	19	9	4	1	4	3	5	6	9	11	11	8	12	0	0	0	2	0
Oct	4.6	4.3	22	N.	N.	24	6	0	1	3	3	6	12	7	14	8	9	9	0	0	0	0	0
Nov	5.8	4.1	24	W.	NW.	6	9	2	2	7	5	8	9	12	9	9	12	15	0	4	0	0	0
Dec	5.1	3.8	28	NW.	N.	14	5	5	1	6	6	9	4	12	12	10	9	8	0	7	0	0	0
Year	5.5	4.4	..	......	NW.	93	81	34	52	65	52	59	138	156	85	142	138	154	2	53	12	25	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

FORT MAGINNIS, MONT.

[Lat., 47° 12′ N.; Long., 109° 10′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	25.52	.80	25.1	25.7	23.4	52	—17	33.0	13.9	13	15	65	69	1.13	.39
Feb ..	25.57	.71	21.5	24.0	21.2	54	—28	30.0	12.4	12	14	70	69	1.39	.37
Mar ..	25.56	.82	36.0	42.9	38.3	67	0	49.6	27.0	25	32	67	68	1.89	.65
Apr ..	25.56	.81	40.8	53.4	45.8	74	26	56.5	35.0	28	33	64	49	1.11	.88
May .	25.51	.96	45.2	53.6	46.2	82	23	57.0	35.4	31	34	62	52	2.71	.78
June .	25.58	.53	58.0	66.5	59.0	91	38	71.0	48.0	39	41	51	41	.61	.34
July .	......	.....	.....	.....	63.5	86	36	75.8	51.2	....	....	....	....	.87	.36
Aug ..	......	.....	.....	.....	67.2	92	43	80.3	54.2	....	....	....	....	1.16	.83
Sept .	......	.....	.....	.....	53.8	82	24	65.0	42.7	....	....	....	....	1.43	.50
Oct ..	......	.....	.....	.....	50.2	87	21	61.1	39.2	....	....	....	....	.05	.05
Nov ..	......	.....	.....	.....	35.2	60	4	45.7	24.8	....	....	....	....	.94	.29
Dec ..	......	.....	.....	.....	30.0	54	—17	39.6	20.3	....	....	....	....	.60	.13
Year .	......	.....	.....	.....	44.5	92	—28	55.4	33.7	....	....	....	....	13.89	.....

MANCHESTER, N. H.

[Lat., 42° 58′ N.; Long. 71° 28′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.73	1.51	26.6	30.4	29.9	60	3	37.8	22.0	21	23	80	74	2.79	.90
Feb ..	29.80	1.61	17.4	21.8	20.7	50	— 9	29.5	11.9	12	14	78	72	1.71	.50
Mar ..	29.61	1.57	32.4	36.3	35.6	62	14	43.9	27.4	22	24	68	63	2.10	.89
Apr ..	29.72	1.05	45.3	47.4	48.0	79	24	58.3	37.7	33	34	66	62	2.45	1.18
May .	29.70	.72	57.4	60.5	60.0	94	36	71.7	48.2	46	48	68	66	2.29	.80
June .	29.74	.93	65.5	67.2	67.4	88	42	77.0	57.7	57	58	74	74	3.04	.89
July .	29.72	.64	66.9	67.6	68.6	87	52	76.9	60.2	59	60	78	79	5.38	1.43
Aug ..	29.80	.61	63.1	65.3	65.7	85	43	75.6	55.8	56	58	78	78	1.72	.82
Sept .	29.80	.97	58.5	60.4	61.8	85	38	70.1	53.4	52	55	81	83	3.32	1.50
Oct ..	29.78	.92	43.2	44.5	45.9	71	22	54.5	37.3	36	38	78	78	3.52	.87
Nov ..	29.78	1.27	38.4	40.4	41.0	65	18	47.8	34.1	32	32	80	74	5.01	2.08
Dec ..	29.84	1.68	29.3	32.1	32.6	63	4	41.2	24.0	23	24	78	75	3.61	.83
Year .	29.75	1.12	45.3	47.8	48.1	94	— 9	57.0	39.1	37	39	76	73	36.94	.....

MANISTEE, MICH.

[Lat., 44° 13′ N.; Long., 86° 16′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.28	1.50	25.3	28.6	26.6	50	5	31.4	21.9	19	22	78	78	3.05	1.04
Feb ..	29.39	1.27	15.3	20.7	17.4	37	— 9	22.9	12.0	8	13	73	73	2.53	.86
Mar ..	29.32	.66	31.4	35.3	33.1	65	14	39.2	27.0	24	26	75	69	.06	.06
Apr ..	29.34	.94	40.7	44.9	42.2	73	22	49.9	34.5	31	32	68	63	2.04	1.08
May .	29.28	.59	49.7	53.7	50.8	84	33	58.3	43.2	40	42	70	66	3.62	.76
June .	29.30	.78	54.5	58.6	56.4	83	37	63.6	49.1	50	51	86	78	4.96	1.54
July .	29.30	.64	64.4	68.2	65.2	86	50	72.6	57.7	57	57	78	68	2.42	1.44
Aug ..	29.39	.46	63.0	68.0	65.6	86	44	73.5	57.8	55	56	77	66	1.30	.91
Sept .	29.32	.68	57.4	61.3	60.1	87	33	67.7	52.5	50	50	78	69	3.06	1.30
Oct ..	29.46	.90	39.1	43.4	42.1	59	22	48.3	35.9	34	35	83	74	.45	.18
Nov ..	29.36	1.17	35.0	37.8	36.6	51	16	41.4	31.9	29	31	80	77	2.89	.87
Dec ..	29.34	1.29	34.6	36.0	34.8	57	15	39.5	30.0	30	32	85	85	3.29	1.12
Year .	29.34	.91	42.5	46.4	44.2	87	— 9	50.7	37.8	36	37	78	72	29.67	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

FORT MAGINNIS, MONT.

[H=4,320. T=19. h=2.]

Month and year.	Mean cloudiness (in tenths).	Wind.														Number of days.								
		Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	3.0	12.8	50	NW.	NW.	7	0	3	0	3	0	3	39	7	12	13	6	10	13	28	0	0	0
Feb ..	4.5	14.7	56	NW.	NW.	10	1	3	1	0	0	3	35	3	11	5	12	11	12	25	0	0	0
Mar ..	4.2	7.9	36	NW.	NW.	8	2	2	6	1	0	2	37	4	12	11	8	7	3	19	0	1	0
Apr ..	4.8	4.4	36	NW.	NW.	5	1	2	8	0	2	2	24	16	7	15	8	5	0	5	0	0	0
May	5.4	10.5	48	NW.	NW.	10	4	2	8	5	0	3	26	4	11	6	14	14	0	8	0	4	0
June .	4.3	9.9	49	NW.	NW.	14	2	1	7	1	1	0	34	0	15	5	10	6	0	0	2	2	0
July .	...	.....	...	......	NW.†	...	...	...	...	...	...	...	...	...	8	8	15	7	0	0	0	..	0
Aug ..	...	.....	...	......	N.	...	...	...	...	...	...	...	...	...	28	0	3	2	0	0	0	..	0
Sept .	...	.....	...	......	NW.	...	...	...	...	...	...	...	...	...	8	8	14	7	0	3	0	..	0
Oct ..	...	.....	...	......	NW.	...	...	...	...	...	...	...	...	...	18	8	5	1	0	9	0	..	0
Nov ..	...	.....	...	......	NW.	...	...	...	...	...	...	...	...	...	13	11	6	8	3	19	0	..	0
Dec ..	...	.....	...	......	NW.	...	...	...	...	...	...	...	...	...	10	10	11	9	6	25	0	..	1
Year .	...	.....	...	......	NW.	...	...	...	...	...	...	...	...	...	153	100	112	87	37	141	2	..	1

MANCHESTER, N. H.

[H=247. T=76. h=68.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	5.0	6.6	32	SE.	NW.	3	5	2	6	5	9	9	22	1	8	16	7	10	6	25	0	0	0
Feb ..	4.1	6.9	26	NW.	NW.	3	0	3	3	6	9	6	26	0	8	16	4	10	16	27	0	0	0
Mar ..	6.0	7.8	26	NW.	NW.	6	10	0	5	1	5	7	24	4	8	10	13	9	0	18	0	0	0
Apr ..	5.2	7.0	30	W.	NW.	9	5	4	11	2	6	5	18	0	9	11	10	11	0	9	0	1	0
May .	5.3	5.1	25	W.	SE.	5	3	3	14	10	7	7	11	2	7	17	7	12	0	0	3	0	0
June .	5.8	4.5	19	NW.	SW.	3	1	3	11	10	16	3	13	0	6	16	8	13	0	0	0	4	0
July .	6.2	4.9	18	SW.	NW.	3	3	3	15	9	7	1	19	2	7	11	13	14	0	0	0	3	0
Aug ..	3.8	3.6	16	W.	NW.	6	2	4	6	7	6	7	13	11	15	8	8	7	0	0	0	0	0
Sept .	6.5	5.0	20	NW.	NW.	3	10	5	2	8	9	2	13	8	8	8	14	10	0	0	0	0	0
Oct ..	5.9	5.1	19	NW.	NW.	9	5	3	4	6	6	7	20	2	8	12	11	13	0	7	0	0	0
Nov ..	6.0	5.5	24	NW.	NW.	6	2	2	4	6	9	14	15	2	9	7	14	15	1	11	0	0	0
Dec ..	4.8	6.0	33	W.	NW.	6	0	1	7	4	5	6	30	3	12	9	10	16	5	20	0	0	0
Year .	5.4	5.7	...	......	NW.	62	46	33	88	74	94	74	224	35	105	141	119	140	28	117	3	8	0

MANISTEE, MICH.

[H=615. T=43. h=28.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	8.0	9.0	36	SW.†	NE.	3	14	3	6	13	7	12	4	0	3	5	23	12	18	29	0	1	0
Feb ..	9.5	10.4	30	SW.†	W.†	6	5	9	3	7	9	9	8	0	0	0	28	17	22	28	0	0	0
Mar ..	5.8	7.6	28	SW.	N.	19	2	7	3	10	5	5	10	1	6	11	14	2	3	25	0	0	0
Apr ..	6.4	8.3	36	SW.	S.	9	2	5	7	19	4	4	9	1	5	9	16	12	1	9	0	2	0
May .	6.6	9.1	30	S.	S.	10	3	3	2	18	6	4	16	0	5	8	18	10	0	0	0	1	0
June .	5.4	6.3	24	S.	SW.	4	3	5	4	13	15	6	4	6	12	5	13	17	0	0	0	1	0
July .	2.9	6.1	26	W.	S.	3	2	5	9	19	10	6	5	3	18	12	1	7	0	0	0	1	0
Aug ..	2.6	7.2	28	SW.	S.	9	0	6	6	21	15	3	1	1	22	5	4	6	0	0	0	0	0
Sept .	4.8	9.2	30	W.	S.	3	1	8	6	20	8	9	5	0	13	8	9	11	0	0	0	0	0
Oct .	4.8	6.9	24	NW.	N.	17	11	10	4	9	3	2	4	2	12	8	11	8	0	10	0	0	0
Nov ..	6.2	9.3	34	SW.	N.	16	3	9	3	6	13	8	1	1	10	3	17	13	1	11	0	0	0
Dec ..	5.5	10.5	48	W.	SW.	3	5	10	11	10	12	11	0	0	12	7	12	16	4	17	0	0	0
Year .	5.7	8.3	...	......	S.	102	51	80	64	165	107	79	67	15	118	81	166	131	49	129	0	6	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

MARQUETTE, MICH.

[Lat., 46° 34′ N.; Long., 87° 24′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. Mean (max. and min.).	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	29.16	1.50	21.6	23.4	23.3	45	3	29.6	17.0	16	17	80	78	3.94	.94
Feb ..	29.28	1.16	8.0	13.4	11.8	48	—21	18.5	5.0	3	7	78	76	2.45	.56
Mar ..	29.20	.73	27.7	31.5	31.1	62	8	38.2	24.0	22	25	78	77	1.02	.18
Apr ..	29.21	1.03	38.0	38.0	39.6	68	18	47.4	31.7	32	32	80	79	2.63	.67
May .	29.16	.72	46.6	47.9	48.2	82	30	56.1	40.3	40	41	79	78	1.16	.25
June .	29.16	.78	53.8	57.2	55.6	87	38	64.1	47.0	47	50	79	78	3.15	.88
July .	29.14	.75	62.3	65.2	64.9	88	45	75.2	54.6	56	57	80	76	4.80	1.46
Aug ..	29.23	.62	61.6	64.9	64.2	88	45	72.1	56.3	55	57	80	77	1.68	.54
Sept .	29.14	.85	54.1	57.9	58.1	84	34	66.1	50.1	48	50	80	76	3.71	1.63
Oct ..	29.36	.80	38.3	40.4	40.6	67	24	46.6	34.5	33	34	81	78	0.78	.35
Nov ..	29.24	1.13	30.8	33.8	33.5	66	14	39.8	27.2	26	27	83	78	2.04	.55
Dec ..	29.18	1.07	27.1	29.3	28.7	46	6	34.8	22.6	21	22	78	74	2.95	1.24
Year .	29.20	.93	39.2	41.9	41.6	88	—21	49.0	34.2	33	35	80	77	30.31	.....

FORT McKINNEY, WYO.

[Lat., 43° 48′ N.; Long., 106° 10′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. Mean (max. and min.).	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan	24.92	.90	21.2	22.6	24.6	52	— 6	35.0	14.2	13	15	71	72	.41	.21
Feb ..	24.96	.80	19.2	25.2	23.8	58	—14	34.3	13.4	12	17	74	72	.81	.40
Mar ..	24.96	.90	36.2	45.9	41.2	64	12	51.4	30.9	24	25	63	48	.13	.11
Apr ..	24.96	.70	43.3	52.4	47.5	72	28	57.9	37.1	29	28	60	44	.41	.26
May .	24.91	1.00	48.5	55.7	49.6	77	30	60.6	38.5	33	34	60	49	.79	.29
June .	24.98	.50	59.6	67.4	61.2	93	36	72.5	50.0	45	41	62	45	1.49	.37
July .	25.02	.60	64.5	73.3	67.2	95	41	79.2	55.3	51	56	63	57	.59	.22
Aug ..	25.01	.60	64.6	76.7	69.6	93	37	82.1	57.0	44	48	50	40	.14	.14
Sept .	25.00	.70	51.5	57.7	55.2	84	31	66.9	43.6	30	31	45	41	.17	.09
Oct ..	25.04	.60	47.1	51.6	51.4	84	21	61.0	41.7	26	29	52	47	.89	.50
Nov ..	25.00	.90	30.7	33.5	33.1	68	10	42.8	23.4	20	21	68	64	.34	.08
Dec ..	24.82	.60	31.2	32.9	35.4	59	3	47.9	22.9	23	25	74	73	.02	.02
Year .	24.96	.73	43.1	49.6	46.6	95	—14	57.6	35.7	29	31	62	54	6.19	.....

MEMPHIS, TENN.

[Lat., 35° 9′ N.; Long., 90° 3′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. Mean (max. and min.).	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.74	.95	38.2	45.1	42.9	65	21	49.2	36.6	32	34	78	68	5.28	2.06
Feb ..	29.84	.96	36.9	45.8	42.8	77	17	50.4	35.1	28	32	71	61	1.90	0.82
Mar ..	29.66	.90	46.6	57.3	54.0	80	33	63.1	44.9	36	36	69	49	5.33	1.39
Apr ..	29.66	.78	57.0	66.6	63.9	83	41	73.4	54.4	46	46	69	51	3.47	1.33
May .	29.66	.57	64.2	72.3	69.8	90	47	79.8	59.9	53	51	68	49	1.48	1.18
June .	29.66	.51	69.8	76.2	74.6	92	50	83.3	65.9	63	63	80	66	7.39	4.12
July .	29.63	.39	76.4	80.8	80.6	94	64	88.9	72.2	70	70	82	72	4.77	1.57
Aug ..	29.72	.23	71.6	78.5	77.4	92	62	86.4	68.3	66	67	81	69	5.62	2.33
Sept .	29.69	.67	65.2	71.8	71.4	92	51	80.2	62.5	60	62	84	72	3.01	1.80
Oct ..	29.76	.70	52.7	62.8	60.8	84	38	70.9	50.7	46	48	80	59	0.75	0.54
Nov ..	29.76	.96	43.2	49.4	48.4	77	24	54.8	42.1	37	37	80	66	5.21	1.79
Dec ..	29.80	.71	54.2	61.7	60.2	76	28	68.0	52.4	47	49	79	65	0.46	0.38
Year .	29.72	.69	56.3	64.0	62.2	94	17	70.7	53.8	49	50	77	62	44.67	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

MARQUETTE, MICH.

[$H=735$. $T=68$. $h=56$.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	6.5	8.6	32	S.	NW.	5	2	3	2	8	5	17	20	0	4	8	19	19	16	31	0	0	0
Feb ..	6.8	10.0	36	NW.	NW.	5	1	0	7	5	7	14	17	0	5	3	20	18	25	28	0	0	0
Mar ..	6.2	8.8	42	NW.	NW.	7	4	0	4	4	1	10	32	0	5	11	15	15	7	29	0	0	0
Apr ..	5.9	8.7	26	W.	NW.	6	3	4	2	12	6	4	21	2	6	8	16	16	0	13	0	0	0
May ..	5.8	9.5	35	S.	NW.	13	4	5	4	12	5	3	14	2	4	15	12	14	0	2	0	2	0
June .	4.6	7.2	25	W.	NW.	8	1	8	1	9	6	3	18	6	9	8	13	12	0	0	0	2	0
July .	5.5	6.9	27	S.	NW.	10	0	5	7	12	4	5	14	5	7	16	8	15	0	0	0	4	2
Aug ..	5.0	8.8	31	SW.	SW.	6	3	3	7	5	13	10	13	2	11	9	11	14	0	0	0	3	0
Sept .	6.3	10.3	36	SW.	NW.	7	1	0	6	10	13	6	14	3	6	13	11	12	0	0	0	0	0
Oct ..	7.2	8.6	30	N.	NW.	11	8	2	4	5	8	8	16	0	5	8	18	10	0	8	0	0	0
Nov ..	6.2	9.0	32	W.	W.	7	9	1	3	3	9	12	15	1	8	8	14	10	5	22	0	0	1
Dec ..	7.4	8.8	37	NW.	W.	7	2	5	7	7	5	17	9	3	3	11	17	15	11	29	0	0	0
Year .	6.1	8.8	..	......	NW.	92	38	36	54	92	82	109	203	24	73	118	174	170	64	162	0	11	3

FORT McKINNEY, WYO.

[$H=5,000$. $T=15$. $h=35$.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	3.1	8.0	60	NW.	W.	8	5	0	1	1	10	20	15	2	15	11	5	3	12	30	0	0	0
Feb ..	4.0	10.5	60	NW.	NW.	9	3	0	3	0	6	16	18	1	8	16	4	8	9	28	0	0	0
Mar ..	3.8	8.9	42	NW.	W.	9	7	4	4	5	4	18	11	0	14	11	6	2	1	15	0	0	0
Apr ..	5.6	10.7	54	NW.	NW.	9	4	10	5	8	3	6	13	2	6	13	11	5	0	5	0	0	0
May ..	5.6	11.6	60	SW.†	N.	18	4	5	6	6	6	2	13	2	7	12	12	12	0	6	0	0	0
June .	5.2	10.2	50	W.	N.	15	5	2	4	10	3	8	13	0	7	10	13	14	0	0	3	3	0
July .	5.0	11.6	56	N.	NW.	9	6	0	4	7	2	12	22	0	6	19	6	7	0	0	2	4	0
Aug ..	3.3	8.2	30	N.	W.	14	12	1	2	2	8	16	6	1	15	10	6	2	0	0	6	0	0
Sept .	4.6	11.1	54	NW.	NW.	7	3	1	5	7	4	14	17	2	15	3	12	5	0	1	0	1	0
Oct ..	5.5	9.5	40	NW.	W.	7	3	3	3	4	10	20	11	1	8	12	11	5	0	3	0	0	0
Nov ..	4.9	8.8	50	W.	W.	8	4	1	1	6	7	26	7	0	13	4	13	9	6	23	0	0	0
Dec ..	4.3	9.3	60	SW.	W.	6	1	0	3	5	10	25	12	0	12	14	5	1	1	26	0	0	0
Year .	4.6	9.9	..	......	W.	119	57	27	41	61	73	183	158	11	126	135	104	73	29	137	11	8	0

MEMPHIS, TENN.

[$H=348$. $T=108$. $h=93$.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	5.3	5.8	30	NW.	SE.	6	8	3	18	8	1	4	14	0	9	10	12	11	2	9	0	1	0
Feb ..	4.9	8.1	36	NW.	SE.	9	3	9	12	7	8	2	6	0	9	10	9	8	2	10	0	0	0
Mar ..	3.4	7.2	30	W.	NW.	9	10	4	11	2	3	10	12	1	18	8	5	13	0	0	0	3	0
Apr ..	3.8	7.1	36	NW.	NE.	12	13	3	6	4	8	3	11	0	18	7	5	9	0	0	0	1	0
May ..	2.4	7.5	30	NW.	NW.	5	3	2	10	9	10	8	15	0	18	11	2	5	0	0	0	2	0
June .	4.8	5.9	33	SW.	S.	4	7	11	8	13	9	1	7	0	11	12	7	13	0	0	3	6	0
July .	5.5	5.4	37	W.	SW.	9	4	6	9	10	12	7	4	1	7	17	7	19	0	0	14	12	0
Aug ..	3.2	4.7	37	N.	E.	13	12	14	7	5	6	3	2	0	18	9	4	7	0	0	4	5	0
Sept .	4.7	5.5	24	N.	N.	16	8	11	7	9	4	0	5	0	11	12	7	9	0	0	4	3	0
Oct ..	3.3	6.3	28	N.	N.	14	10	9	2	7	5	3	11	1	17	10	4	3	0	0	0	0	0
Nov ..	6.4	8.2	36	W.	W.	4	9	6	8	3	1	20	9	0	9	5	16	15	0	3	0	0	0
Dec ..	4.2	7.0	27	SE.	S.	4	5	6	11	26	8	0	2	0	14	11	6	4	0	1	0	1	0
Year .	4.3	6.6	..	......	SE.	105	92	84	109	103	75	61	98	3	159	122	84	116	4	23	25	34	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

MERIDIAN, MISS.

[Lat., 32° 21′ N.; Long., 88° 41′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a.m.	Temperature. 8 p.m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a.m.	Dew-point. 8 p.m.	Relative humidity. 8 a.m.	Relative humidity. 8 p.m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	......	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Feb ..	......	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mar ..	......	.....	.....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Apr ..	......	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
May .	......	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
June .	......	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
July .	......	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Aug ..	......	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sept .	29.66	.57	65.6	73.3	72.6	93	42	83.7	61.6	62	66	88	78	3.92	3.27
Oct ..	29.73	.56	52.2	63.0	62.5	88	32	76.4	48.6	47	50	84	64	0.65	0.65
Nov ..	29.77	.92	43.8	52.1	51.4	77	22	61.5	41.2	40	44	87	76	4.12	0.94
Dec ..	29.86	.54	50.4	59.6	59.0	76	22	70.2	47.9	49	53	94	80	2.09	2.09
Year .	......	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

MILWAUKEE, WIS.

[Lat., 43° 2′ N.; Long., 87° 54′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a.m.	Temperature. 8 p.m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a.m.	Dew-point. 8 p.m.	Relative humidity. 8 a.m.	Relative humidity. 8 p.m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.22	1.47	23.6	28.0	26.2	50	3	32.0	20.5	20	21	86	78	1.95	1.00
Feb ..	29.34	1.41	13.4	19.0	16.2	40	—16	22.9	9.5	10	13	85	79	2.00	0.72
Mar ..	29.24	.67	33.2	37.7	36.6	63	20	42.9	30.2	26	28	77	69	1.07	0.36
Apr ..	29.24	.93	42.4	46.0	45.2	74	28	52.5	38.0	33	36	71	71	2.40	0.94
May .	29.18	.54	51.3	54.5	53.5	84	33	62.3	44.7	41	43	70	68	5.64	1.78
June .	29.20	.77	56.6	60.2	58.6	83	42	66.0	51.1	52	54	86	80	5.21	1.96
July .	29.22	.52	66.3	69.0	67.8	90	54	75.3	60.4	59	60	78	73	3.08	1.01
Aug ..	29.32	.53	65.3	70.1	68.8	90	51	77.1	60.5	56	60	72	71	0.76	0.52
Sept .	29.26	.70	55.5	60.5	59.8	83	34	67.3	52.2	50	51	82	73	3.45	2.59
Oct ..	29.40	.8[illegible]	42.2	47.5	47.1	74	31	53.9	40.3	35	38	76	71	0.56	0.20
Nov ..	29.30	1.09	33.5	37.1	36.4	53	12	41.9	30.9	29	31	85	80	2.71	1.36
Dec ..	29.27	1.25	34.2	38.1	37.0	60	14	43.3	30.7	29	32	84	79	2.87	0.66
Year .	29.27	.90	43.1	47.3	46.1	90	—16	53.1	39.1	37	39	79	74	31.70	.....

MOBILE, ALA.

[Lat., 30° 41′ N.; Long., 88° 2′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a.m.	Temperature. 8 p.m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a.m.	Dew-point. 8 p.m.	Relative humidity. 8 a.m.	Relative humidity. 8 p.m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	30.06	.76	46.0	53.5	51.3	69	31	59.0	43.6	42	46	87	76	5.07	1.32
Feb ..	30.18	.72	45.9	53.0	50.9	70	29	58.4	43.4	41	44	83	74	4.64	1.82
Mar ..	29.98	.86	52.2	60.3	58.6	77	38	67.9	49.4	47	49	83	68	3.48	1.50
Apr ..	30.00	.73	62.1	69.8	67.6	85	44	77.2	58.0	56	55	81	63	1.65	1.13
May .	30.03	.54	67.1	73.2	70.5	85	46	79.8	61.2	61	59	80	63	2.9[illegible]	1.36
June .	30.02	.34	75.1	78.3	77.4	92	50	84.8	69.9	69	72	82	74	5.35	2.39
July .	30.00	.29	78.7	80.5	81.3	95	70	88.7	73.7	75	73	88	79	9.55	2.07
Aug ..	30.04	.27	75.7	80.0	79.3	90	66	86.9	71.7	72	71	88	74	2.80	1.05
Sept .	29.99	.68	71.4	77.8	76.7	93	53	85.6	67.8	68	68	88	72	6.97	2.72
Oct ..	30.07	.42	57.9	68.1	66.0	85	43	76.8	55.3	55	57	90	69	0.08	0.04
Nov ..	30.11	.85	48.9	57.7	56.4	77	30	66.0	46.7	46	51	91	80	6.78	1.97
Dec ..	30.22	.49	53.9	62.4	61.0	77	32	70.3	51.6	53	58	96	86	.53	.30
Year .	30.06	.58	61.2	67.9	66.4	95	29	75.1	57.7	57	59	86	73	49.88	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

MERIDIAN, MISS.

[H=358. T=53. h=42.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
1889.																							
Jan	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Feb	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mar	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Apr	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
May	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
June	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
July	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Aug	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sept	4.5	3.6	24	N.	N.	11	6	2	3	3	2	1	3	29	15	8	7	7	0	0	6	1	0
Oct	2.8	4.4	36	W.	N.	11	0	3	1	3	1	1	4	38	23	5	3	2	0	1	0	1	0
Nov	5.0	5.0	33	S.	NW.	8	1	3	3	5	4	5	10	21	11	9	10	12	0	2	0	1	0
Dec	4.5	3.9	26	S.	S.	4	1	1	0	19	2	1	0	34	13	14	4	2	0	3	0	0	0
Year	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

MILWAUKEE, WIS.

[H=697. T=100. h=100.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
Jan	5.6	11.3	48	SW.†	W.	5	2	5	6	2	12	16	11	3	11	6	14	10	15	29	0	0	0
Feb	5.9	12.4	46	N.	NW.†	2	0	2	5	4	3	17	17	6	7	9	12	11	19	27	0	0	0
Mar	4.9	10.7	34	N.	N.	14	8	1	8	2	4	12	9	4	10	10	11	6	3	18	0	0	1
Apr	4.8	11.1	48	SW.	NW.	4	9	2	8	10	7	4	12	4	11	7	12	11	0	4	0	3	0
May	5.3	10.8	42	NE.	N.	16	8	2	2	8	8	6	7	5	7	17	7	16	0	0	0	4	0
June	5.8	6.4	35	NE.	N.	11	5	2	3	6	9	5	7	12	8	10	12	15	0	0	0	3	0
July	3.5	8.6	30	SW.	E.	8	7	10	7	9	9	9	3	0	16	10	5	10	0	0	0	4	0
Aug	3.4	9.0	32	W.	SW.	6	5	2	11	9	14	7	7	1	19	8	4	6	0	0	0	3	0
Sept	4.7	10.3	36	NW.	SW.	4	7	3	6	9	13	10	7	1	12	9	9	7	0	0	0	1	0
Oct	4.9	11.1	38	W.	N.	17	4	3	6	7	3	7	12	3	12	10	9	7	0	1	0	0	0
Nov	6.4	12.6	42	NW.	NW.	7	8	3	0	3	8	14	17	0	11	4	15	12	3	14	0	0	0
Dec	6.5	12.3	44	NW.	W.	3	4	1	7	9	12	17	9	0	7	8	16	14	1	18	0	1	0
Year	5.1	10.6	..	......	W.	97	67	36	69	78	102	124	118	39	131	108	126	125	41	111	0	19	1

MOBILE, ALA.

[H=35. T=87. h=81.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
Jan	7.0	7.4	36	SE.	NW.	17	8	2	5	7	1	2	18	2	2	13	16	13	0	1	0	2	0
Feb	6.4	7.1	36	NW.	N.	17	6	4	1	12	3	4	8	1	2	10	16	10	0	1	0	0	0
Mar	4.0	8.6	36	SW.	NW.	12	2	2	6	11	8	6	15	0	9	15	7	5	0	0	0	1	0
Apr	3.9	8.5	60	SE.	S.	15	5	1	4	16	6	2	10	1	11	14	5	4	0	0	0	2	0
May	3.0	8.2	30	NW.	S.	14	2	2	2	15	11	3	13	0	16	13	2	5	0	0	0	2	0
June	5.7	7.8	36	SW.	S.	8	6	0	10	17	12	2	5	0	1	21	8	9	0	0	3	1	0
July	6.5	5.5	23	S.	S.	10	8	3	2	11	9	10	8	1	0	18	13	21	0	0	11	7	0
Aug	4.7	6.0	32	SE.	S.	13	12	5	7	13	5	3	4	0	10	15	6	13	0	0	3	1	0
Sept	3.5	6.7	30	N.	N.	22	7	2	9	6	5	3	4	2	11	13	6	7	0	0	8	1	0
Oct	2.6	6.9	24	NW.	N.	30	0	0	6	9	6	6	5	0	20	9	2	4	0	0	0	0	0
Nov	3.6	8.1	36	S.	NW.	18	2	0	4	6	7	3	20	0	18	5	7	11	0	2	0	0	0
Dec	3.9	5.4	26	SE.	S.	18	1	0	5	24	8	1	3	2	12	13	6	2	0	1	0	0	0
Year	4.6	7.2	..	......	N.	194	59	21	61	147	81	45	113	9	112	159	94	104	0	5	25	17	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

MONTGOMERY, ALA.

[Lat., 32° 23′ N.; Long., 86° 18′ W.]

Month and year.	Pressure.		Temperature.							Dew-point.		Relative humidity.		Precipitation.	
								Mean.							
	Mean.	Range.	8 a. m.	8 p. m.	Mean (max. and min.).	Maximum.	Minimum.	Maximum.	Minimum.	8 a. m.	8 p. m.	8 a. m.	8 p. m.	Total.	Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	29.86	.72	42.8	51.9	48.4	70	26	56.4	40.3	35	38	76	62	6.70	1.78
Feb ..	29.98	.79	42.1	51.7	48.2	80	21	56.6	39.8	35	37	78	60	3.49	1.42
Mar ..	29.76	.89	48.4	61.2	57.0	82	33	67.5	46.5	41	41	76	50	2.95	1.73
Apr ..	29.78	.79	58.5	70.3	66.7	87	41	78.3	55.1	49	49	73	51	3.13	2.21
May .	29.81	.59	64.6	76.7	71.6	92	44	83.7	59.5	54	50	70	40	1.28	1.01
June .	29.83	.46	72.7	79.8	78.2	94	48	88.3	68.8	64	63	75	60	4.02	2.67
July .	29.80	.27	76.7	82.3	81.9	99	66	91.0	72.8	71	69	82	66	5.70	2.83
Aug ..	29.86	.28	73.3	78.1	78.5	94	63	88.0	69.0	67	66	80	69	6.33	2.72
Sept .	29.81	.64	68.1	76.7	75.4	95	50	85.7	65.0	61	60	78	60	4.35	3.17
Oct ..	29.87	.61	54.2	66.2	63.8	87	39	75.9	51.7	49	51	83	59	1.01	0.94
Nov ..	29.90	.84	47.8	56.1	54.6	77	27	64.3	45.0	44	48	87	75	6.17	1.74
Dec ..	30.02	.50	50.9	61.8	59.1	79	29	69.7	48.5	48	53	91	73	0.49	0.25
Year .	29.86	.62	58.3	67.7	65.3	99	21	75.4	55.1	52	52	79	60	45.62	.....

MONTROSE, COLO.

[Lat., 38° 30′ N.; Long., 107° 50′ W.]

Jan ..	24.28	.80	13.7	21.3	20.2	44	—6	32.9	7.6	6	12	72	68	.59	.22
Feb ..	24.31	.98	18.8	32.8	27.5	54	—6	40.5	14.5	9	18	65	55	.44	.40
Mar ..	24.26	.62	34.0	51.3	43.5	68	23	56.1	30.9	20	22	58	34	.05	.05
Apr ..	24.26	.67	43.4	61.4	52.8	80	25	66.6	38.9	26	27	54	31	.86	.54
May .	24.23	.72	50.1	65.2	57.2	84	31	71.2	43.3	30	27	48	30	.60	.38
June .	24.31	.36	56.3	75.5	65.3	90	36	81.3	49.3	31	29	40	21	.28	.16
July .	24.34	.30	61.8	82.2	73.0	96	49	88.1	58.0	41	35	50	23	.84	.23
Aug ..	24.38	.34	60.3	80.8	72.1	94	49	87.5	56.7	44	40	57	26	.35	.13
Sept .	24.34	.51	49.2	69.3	60.5	87	27	74.8	46.2	28	29	47	27	.80	.43
Oct ..	24.36	.49	42.2	56.5	52.2	83	27	65.2	39.2	26	29	56	40	.47	.34
Nov ..	24.39	.58	26.1	36.0	33.2	61	10	43.9	22.4	14	18	62	51	.58	.42
Dec ..	24.27	.69	36.2	39.5	38.4	61	7	47.4	29.5	20	21	56	51	1.34	.40
Year .	24.31	.59	41.0	56.0	49.7	96	—6	63.0	36.4	25	26	55	38	7.20	.....

MOORHEAD, MINN.

[Lat., 46° 52′ N.; Long., 96° 44′ W.]

Jan ..	29.02	1.18	5.9	11.2	9.8	46	—29	19.0	0.5	4	8	92	87	1.13	.56
Feb ..	29.12	1.47	—3.7	4.1	0.5	39	—35	10.7	—9.7	—5	2	95	89	.85	.38
Mar ..	29.07	.67	25.5	35.8	32.6	68	—2	42.6	22.7	22	27	86	72	.24	.24
Apr ..	29.00	.96	36.4	51.8	45.2	82	20	58.2	32.3	32	37	83	60	1.48	.46
May .	28.94	1.39	46.0	60.5	52.0	87	20	65.3	38.6	39	43	78	55	1.71	.77
June .	28.94	.65	57.4	71.4	63.7	90	35	77.6	49.8	50	52	78	52	.96	.34
July .	28.92	.57	61.3	73.7	66.8	93	39	78.5	55.3	56	58	85	60	1.95	1.02
Aug ..	28.96	.67	60.5	75.8	68.6	96	38	82.3	55.0	55	56	82	52	1.40	.64
Sept .	28.92	.82	47.7	58.5	54.3	94	29	64.5	44.1	42	46	83	65	6.27	4.30
Oct ..	29.13	.72	34.7	46.8	43.6	78	18	54.5	32.6	30	34	82	65	.07	.06
Nov ..	29.10	1.03	17.9	27.3	24.8	59	—5	35.1	14.6	14	20	87	76	.18	.06
Dec ..	28.98	.96	15.4	21.7	20.0	41	—8	28.5	11.5	13	17	89	83	.83	.70
Year .	29.01	.92	33.8	44.9	40.2	96	—35	51.4	28.9	29	33	85	68	17.07	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

MONTGOMERY, ALA.

[H=217. T=68. h=60.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan	6.0	5.7	29	W.	NE.	5	13	10	5	2	2	10	9	6	5	11	15	12	0	2	0	0	0
Feb	6.2	6.1	24	W.	W.	6	7	7	6	3	8	9	6	4	5	9	14	8	0	5	0	2	0
Mar	4.0	5.7	28	NW.	NW.	5	5	7	6	5	8	6	16	4	14	10	7	8	0	0	0	0	0
Apr	3.6	5.2	25	SW.	W.	8	6	1	2	8	9	13	7	6	16	6	8	7	0	0	0	5	0
May	2.1	5.4	24	W.	NW.	4	5	3	5	2	12	10	16	5	18	12	1	4	0	0	2	2	0
June	5.8	4.7	27	E.	SE.	6	7	8	12	7	9	5	5	1	8	9	13	14	0	0	13	10	0
July	6.7	4.2	21	SW.	SW.	3	4	7	3	4	18	17	6	0	3	18	10	14	0	0	19	9	0
Aug	5.4	3.9	23	SW.	NE.	9	13	10	7	7	2	5	3	6	8	18	5	12	0	0	9	15	0
Sept	4.2	3.9	26	NE.	N.	16	5	9	7	3	1	9	1	9	13	12	5	10	0	0	9	0	0
Oct	2.6	3.6	21	NW.	N.	18	3	2	5	3	5	8	6	12	20	9	2	3	0	0	0	1	0
Nov	4.5	5.0	24	W.	W.	9	2	4	8	2	3	14	11	7	14	7	9	12	0	2	0	2	0
Dec	3.3	2.9	24	NE.	SW.	4	5	3	7	9	17	4	2	11	19	6	6	3	0	2	0	0	0
Year	4.5	4.7	...	......	W.	93	75	71	73	55	94	110	88	71	143	127	95	107	0	11	52	46	0

MONTROSE, COLO.

[H=5,705. T=30. h=32.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	3.7	4.1	26	NW.	SE.	3	0	5	39	2	1	3	1	8	17	6	8	7	12	31	0	0	0
Feb	3.2	4.8	26	SE.	SE.	7	1	3	30	3	0	3	3	6	19	3	6	3	5	27	0	0	0
Mar	4.4	5.2	28	SW.	SE.	7	2	4	25	7	0	7	8	2	14	8	9	1	0	18	0	0	0
Apr	4.0	6.4	31	S.	SE.	4	3	6	21	7	6	6	6	1	14	8	8	4	0	5	0	0	0
May	4.4	7.7	48	SW.	SE.	6	2	3	23	12	4	8	4	0	11	11	9	7	0	2	0	0	0
June	2.6	6.9	38	S.	SE.	6	0	1	30	9	3	6	5	0	21	5	4	6	0	0	0	1	0
July	3.2	5.8	30	S.	SE.	5	0	2	24	18	2	4	7	0	18	13	0	10	0	0	13	7	0
Aug	4.4	5.8	29	SE.	S.	4	3	1	14	27	4	2	7	0	10	19	2	8	0	0	8	8	0
Sept	2.8	5.7	25	SW.	S.	6	3	2	4	24	9	0	12	0	19	7	4	5	0	4	0	2	0
Oct	3.7	5.1	26	NE.	S.	9	4	3	7	27	2	1	8	1	15	13	3	7	0	5	0	0	0
Nov	4.1	4.3	25	S.	S.	4	1	1	9	33	1	3	3	5	16	7	7	5	1	27	0	0	0
Dec	6.3	5.2	36	S.	S.	0	4	3	15	24	6	3	7	0	6	11	14	10	2	18	0	0	0
Year	3.9	5.6	...	......	SE.	61	23	34	241	193	38	46	71	23	180	111	74	73	20	137	21	18	0

MOORHEAD, MINN.

[H=926. T=52 h=41.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	3.7	9.1	37	N.	N.	21	3	1	5	9	9	4	9	1	10	9	12	6	25	31	0	0	0
Feb	4.4	9.9	40	S.	S.†	15	3	0	2	15	5	2	13	1	11	8	9	8	27	28	0	0	0
Mar	3.0	10.7	36	NW.	N.	18	6	2	5	11	6	2	8	4	13	11	7	2	6	25	0	0	3
Apr	3.4	12.6	46	S.	N.	18	10	2	9	10	2	0	5	4	12	14	4	6	0	14	0	1	2
May	3.5	11.5	50	SE.	N.	17	7	2	8	12	5	4	7	0	14	13	4	9	0	5	0	1	0
June	3.6	10.3	48	S.	S.	12	9	1	12	16	4	3	3	0	14	8	8	9	0	0	0	2	0
July	4.8	10.0	48	S.	N.	22	4	1	8	16	3	2	6	0	9	15	7	8	0	0	1	5	0
Aug	3.1	11.2	42	S.	S.	14	6	2	12	15	3	3	6	1	20	9	2	7	0	0	2	6	0
Sept	5.2	12.6	50	S.	N.	13	6	0	10	8	7	5	11	0	10	12	8	10	0	2	1	4	0
Oct	4.5	11.0	33	S.	N.	19	2	2	13	17	4	1	4	0	16	5	10	2	1	14	0	0	0
Nov	4.4	9.2	30	N.	N.	16	2	0	7	14	6	2	11	2	14	12	4	8	13	30	0	0	2
Dec	5.8	8.5	34	SE.	N.	15	1	0	9	10	8	2	8	9	9	9	13	7	18	31	0	0	0
Year	4.1	10.6	...	......	N.	200	59	13	100	153	62	30	91	22	152	125	88	82	90	180	4	19	7

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

NANTUCKET, MASS.

[Lat., 41° 17′ N.; Long., 70° 6′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	30.00	1.45	36.1	36.9	37.7	54	16	43.9	31.5	33	34	88	89	5.03	1.91
Feb ..	30.07	1.45	27.5	28.6	27.9	48	4	33.9	21.9	24	24	87	85	4.23	1.60
Mar ..	29.84	1.45	36.5	36.6	36.4	52	26	40.8	32.1	33	33	88	89	5.46	1.29
Apr ..	29.96	1.02	45.4	43.8	44.4	62	32	49.1	39.7	43	40	92	89	4.02	.96
May .	29.97	.75	55.6	53.2	54.2	69	40	60.3	48.2	52	50	89	89	2.26	1.78
June .	30.03	.90	64.5	62.3	63.6	76	52	69.0	58.2	61	59	89	89	3.45	2.15
July .	29.99	.64	68.4	65.8	67.1	79	57	72.5	61.5	65	62	88	88	2.92	.87
Aug ..	30.06	.57	68.7	66.6	67.4	80	59	71.8	63.0	65	62	88	85	11.05	5.73
Sept .	30.04	.88	63.9	62.6	63.0	76	50	67.7	58.2	60	58	87	87	3.12	.80
Oct ..	30.00	.85	52.9	52.6	52.0	68	41	56.5	47.4	49	48	86	86	6.58	2.08
Nov ..	30.05	1.26	47.8	47.5	46.1	60	28	50.7	41.5	43	42	84	83	7.80	1.87
Dec ..	30.12	1.61	41.4	42.3	39.0	54	24	45.7	32.2	36	38	84	84	2.07	.42
Year .	30.01	1.07	50.7	49.9	49.9	80	4	55.2	44.6	47	46	88	87	57.99	.....

NASHVILLE, TENN.

[Lat., 36° 10′ N.; Long., 86° 47′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.49	.89	34.9	42.3	40.0	61	20	47.6	32.5	31	34	85	74	3.83	1.17
Feb ..	29.60	.88	31.9	40.9	37.8	70	12	46.1	29.5	26	30	81	66	1.84	.80
Mar ..	29.41	.79	42.3	54.4	50.4	78	26	60.5	40.3	36	36	79	53	2.47	.72
Apr ..	29.42	.73	53.4	64.1	60.0	85	33	70.7	49.4	44	43	71	50	2.83	1.27
May .	29.43	.64	59.9	69.7	65.8	91	40	77.4	54.3	51	49	74	50	5.00	2.20
June .	29.46	.48	68.3	73.8	72.1	88	46	80.9	63.3	62	63	80	70	5.33	1.05
July .	29.42	.39	73.8	79.3	78.2	93	62	87.2	69.2	69	69	84	71	2.74	.71
Aug ..	29.50	.27	68.5	77.3	75.0	90	58	85.3	64.6	63	64	84	64	1.57	.94
Sept .	29.47	.69	61.6	70.6	68.6	91	40	78.6	58.5	58	59	86	67	6.81	1.62
Oct ..	29.52	.61	48.2	60.1	57.2	83	30	68.4	45.9	44	46	85	60	1.54	.84
Nov ..	29.54	1.06	43.2	48.3	47.7	74	23	55.2	40.2	38	39	84	72	6.88	1.25
Dec ..	29.62	.67	50.5	58.4	56.4	73	25	64.7	48.0	44	46	79	66	1.17	.64
Year .	29.49	.68	53.0	61.6	59.1	93	12	68.6	49.6	47	48	81	64	42.01	.....

NEW HAVEN, CONN.

[Lat., 41° 18′ N.; Long., 72° 56′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.91	1.47	31.2	34.8	34.2	55	11	40.3	28.1	25	28	77	78	4.47	1.14
Feb ..	30.00	1.38	21.1	26.4	25.0	49	— 3	32.2	17.9	13	19	72	74	2.08	.98
Mar ..	29.77	1.37	35.0	38.2	38.7	62	22	46.3	31.1	27	30	73	75	1.44	.29
Apr ..	29.86	1.18	45.9	48.4	48.6	71	32	57.0	40.2	38	39	74	73	4.01	1.11
May .	29.86	.73	56.8	58.7	59.6	91	37	68.9	50.4	50	52	79	81	3.81	1.15
June .	29.92	.88	65.1	66.3	67.4	85	47	75.7	59.0	60	61	85	85	3.17	1.35
July .	29.88	.63	68.9	70.3	70.0	88	55	77.5	62.5	64	64	85	82	17.08	6.15
Aug ..	29.96	.59	65.9	68.4	68.5	85	50	76.8	60.2	60	62	81	81	4.38	1.92
Sept .	29.93	.89	61.1	62.5	63.0	80	42	69.9	56.2	57	58	87	87	4.98	1.40
Oct ..	29.92	.83	45.9	48.9	48.8	72	28	56.3	41.3	39	41	78	76	3.96	1.06
Nov ..	29.96	1.28	42.5	44.0	44.2	63	20	50.1	38.3	37	37	82	77	7.78	2.62
Dec .	30.04	1.41	35.3	38.6	38.8	68	8	47.2	30.5	28	31	76	76	2.62	.97
Year .	29.92	1.05	47.9	50.5	50.6	91	— 3	58.2	43.0	42	44	79	79	59.78	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

NANTUCKET, MASS.

[H=14. T=43. h=3.]

Month and year.	Mean cloudiness (in tenths).	Wind.													Number of days.								
		Average hourly vol. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	4.7	11.9	42	SE.	NW.	7	3	3	8	5	11	8	17	0	12	8	11	10	0	12	0	0	0
Feb ..	5.5	13.1	36	NW.†	NW.	6	3	4	4	2	5	7	25	0	10	8	10	13	8	26	0	0	0
Mar ..	5.0	15.3	54	NE.	NW.†	8	15	5	0	6	8	5	15	0	11	7	13	12	0	10	0	0	0
Apr ..	4.2	13.1	45	NE.	SW.	5	11	8	2	9	13	7	5	0	9	9	12	10	0	0	0	2	0
May .	3.6	9.6	45	NE.	SW.	1	6	6	3	16	19	7	4	0	13	10	8	6	0	0	0	1	0
June .	4.8	9.0	28	NE.	SW.†	1	4	2	2	19	19	11	2	0	10	11	9	8	0	0	0	0	0
July .	5.3	8.6	33	NE.	S.	6	9	3	4	19	11	7	3	0	12	10	9	10	0	0	0	1	0
Aug.	6.1	9.2	35	S.	SW.	4	6	13	2	7	18	9	3	0	8	10	13	9	0	0	0	2	0
Sept .	5.6	12.6	42	E.	E.†	2	8	12	4	12	11	5	6	0	11	9	10	9	0	0	0	0	0
Oct ..	5.9	14.0	46	NE.	NE.	6	19	2	3	6	9	8	9	0	10	9	12	8	0	0	0	1	0
Nov ..	6.4	11.0	44	E.	NW.	3	1	5	6	5	7	16	17	0	8	7	15	16	0	3	0	0	0
Dec ..	6.2	9.7	49	NW.	NW.	7	10	9	4	6	4	10	12	0	11	7	13	11	0	16	0	0	0
Year .	5.3	11.4	...	......	SW.	56	95	72	42	112	135	100	118	0	125	105	135	122	8	67	0	7	0

NASHVILLE, TENN.

[H=553. T=98. h=85.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vol. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	5.9	6.1	36	W.	SE.	5	8	5	16	3	3	11	11	0	1	18	12	12	2	15	0	0	0
Feb ..	6.2	6.8	36	W.	NW.	2	6	7	8	5	4	6	16	2	4	13	11	9	3	18	0	1	0
Mar ..	4.5	6.3	32	W.	NW.	7	8	13	3	4	3	4	18	2	8	16	7	9	0	4	0	1	0
Apr ..	4.0	6.6	29	NW.	N.	14	4	3	5	8	5	7	11	3	13	10	7	10	0	0	0	2	0
May .	3.6	6.6	42	NW.	W.	2	4	2	11	7	8	13	11	4	15	11	5	10	0	0	1	7	0
June	5.2	4.8	30	SE.	SE.	3	5	8	14	6	5	8	8	3	7	14	9	14	0	0	0	9	0
July .	5.7	4.1	36	NW.	S.	4	4	4	2	17	8	4	10	9	9	19	3	14	0	0	5	8	0
Aug ..	3.7	3.3	24	SW.	N.	13	10	3	2	5	4	2	2	21	17	10	4	10	0	0	0	4	0
Sept .	4.8	4.2	24	NE.	NW.	7	4	9	7	5	0	7	11	10	14	7	9	11	0	0	1	2	0
Oct ..	4.0	4.9	28	NW.	N.	12	2	6	5	3	3	9	10	12	18	7	6	6	0	1	0	3	0
Nov ..	6.7	6.3	25	NW.	W.	7	4	3	12	5	4	15	8	2	7	8	15	16	0	4	0	0	0
Dec ..	5.7	5.8	24	S.	S.	4	4	4	13	21	4	2	5	5	10	8	13	8	0	2	0	1	0
Year .	5.0	5.5	...	......	NW.	80	63	67	98	89	51	88	121	73	123	141	101	129	5	44	7	38	0

NEW HAVEN, CONN.

[H=107. T=118. h=109.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vol. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	4.7	8.5	42	NE.	SW.†	9	8	1	1	6	15	6	15	1	12	9	10	11	3	19	0	0	0
Feb ..	5.0	8.4	30	W.	NW.	7	8	1	2	4	5	13	14	2	10	8	10	11	11	26	0	0	0
Mar ..	6.1	11.1	45	NE.	NE.	5	18	2	3	3	10	7	10	4	8	9	14	13	0	15	0	1	0
Apr ..	6.2	9.4	36	NE.	NE.†	12	12	4	5	9	4	4	10	0	7	10	13	14	0	0	0	3	0
May .	4.8	6.4	40	N.	SE.†	4	6	3	13	13	10	6	7	0	12	13	6	9	0	0	1	3	0
June .	5.9	6.3	24	SE.	S.	4	2	4	5	19	15	6	5	0	8	11	11	15	0	0	0	7	0
July .	6.0	7.1	29	S.	S.	9	4	7	5	16	4	6	11	0	10	8	13	18	0	0	0	6	0
Aug ..	4.6	6.1	21	NE.	SW.	12	8	3	2	3	18	5	9	2	11	14	6	10	0	0	0	4	0
Sept .	6.7	9.1	36	NE.	NE.	3	17	4	2	11	6	4	11	2	7	8	15	17	0	0	0	0	0
Oct ..	6.6	9.3	40	NE.	NE.	6	21	2	2	5	6	8	11	1	4	12	15	14	0	2	0	2	0
Nov ..	6.0	8.2	31	SE.	W.	6	11	2	2	4	8	18	7	2	9	7	14	18	0	7	0	0	0
Dec ..	5.7	8.4	41	NW.	NW.	7	11	0	2	3	11	13	14	1	8	13	10	17	3	15	0	0	0
Year .	5.7	8.2	...	......	NE.	84	126	33	44	96	112	96	124	15	106	122	137	167	17	84	1	26	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

NEW LONDON, CONN.

[Lat., 41° 21′ N.; Long., 72° 5′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	29.96	1.46	34.2	37.0	36.2	55	12	42.4	30.0	28	30	79	78	3.54	0.72
Feb ..	30.05	1.43	25.4	28.9	27.2	46	1	34.2	20.3	17	20	72	71	2.47	0.60
Mar ..	29.82	1.40	37.7	39.0	39.2	59	24	45.9	32.6	30	32	74	76	2.37	0.74
Apr ..	29.92	1.14	47.9	48.9	48.8	68	34	56.1	41.5	42	42	80	79	4.02	1.26
May .	29.91	.74	58.6	58.6	58.7	82	40	66.1	51.3	53	53	81	82	3.84	1.78
June .	29.97	.89	66.6	66.3	67.0	85	50	73.6	60.5	62	62	85	86	4.13	1.23
July .	29.93	.63	69.5	69.7	69.9	86	55	75.9	63.9	63	64	81	83	6.91	1.40
Aug ..	30.00	.59	67.5	68.7	69.0	83	53	75.3	62.7	60	62	78	80	4.15	2.04
Sept .	29.98	.87	62.5	63.4	63.8	79	44	69.0	58.6	57	57	83	80	4.93	0.90
Oct ..	29.96	.82	48.9	50.6	50.2	68	31	56.6	43.8	42	44	77	77	5.25	2.60
Nov ..	30.00	1.27	45.0	45.9	45.8	62	23	50.9	40.8	39	39	80	77	6.19	1.33
Dec ..	30.08	1.49	37.8	40.8	40.0	59	13	46.6	33.3	30	32	75	72	1.90	0.53
Year .	29.96	1.06	50.1	51.5	51.3	86	1	57.7	44.9	44	45	79	78	49.70	.....

NEW ORLEANS, LA.

[Lat., 29° 58′ N.; Long., 90° 4′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	30.02	.68	48.5	54.5	53.4	75	34	60.1	46.6	42	47	80	78	6.51	1.23
Feb ..	30.14	.71	49.2	54.6	53.4	76	32	59.8	47.1	46	49	88	81	2.78	1.02
Mar ..	29.95	.78	54.1	62.8	61.0	79	44	69.2	52.8	50	54	87	73	3.86	1.39
Apr ..	29.97	.69	64.2	71.6	70.2	88	54	79.1	61.4	58	58	81	64	2.28	1.79
May .	30.00	.55	68.4	75.2	73.8	90	54	83.0	64.5	60	58	76	58	1.17	0.47
June .	29.98	.33	73.8	77.8	78.2	92	58	86.0	70.3	68	69	84	74	7.62	2.86
July .	29.98	.25	79.1	82.4	82.6	95	71	90.1	75.2	74	74	86	75	9.13	2.04
Aug ..	29.98	.23	77.2	80.1	80.6	92	70	87.4	73.9	71	71	83	75	5.59	1.71
Sept .	29.94	.62	73.5	78.5	78.6	94	58	86.5	70.8	67	68	81	72	6.40	2.03
Oct ..	30.04	.49	62.5	70.4	70.4	90	50	80.0	60.8	56	57	81	65	0.26	0.25
Nov ..	30.09	.87	52.2	59.4	58.7	82	38	67.1	50.3	48	53	86	81	2.18	0.68
Dec ..	30.18	.51	56.2	64.2	64.3	80	39	74.3	54.3	54	59	91	85	0.67	0.65
Year .	30.02	.56	63.2	69.3	68.8	95	32	76.9	60.7	58	60	84	73	48.45	.....

NEW YORK CITY.

[Lat., 40° 43′ N.; Long., 74° W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.84	1.47	34.3	38.2	37.6	58	17	43.5	31.7	26	33	72	82	5.38	1.87
Feb ..	29.95	1.39	24.1	29.0	28.0	50	2	34.5	21.4	17	23	75	77	3.07	1.38
Mar ..	29.70	1.30	37.5	42.3	41.5	62	25	48.3	34.7	29	32	72	68	4.09	1.38
Apr ..	29.78	1.25	48.2	51.9	51.6	80	34	59.9	43.3	39	41	72	68	5.90	2.81
May .	29.78	.72	58.1	61.9	62.0	87	40	70.9	53.1	50	53	77	75	3.25	.91
June .	29.84	.86	67.0	70.5	70.4	88	53	78.2	62.5	60	62	79	76	2.38	.74
July .	29.80	.60	71.1	74.3	73.5	88	60	80.9	66.1	64	65	80	74	9.63	2.77
Aug ..	29.89	.58	67.9	72.9	71.5	90	56	78.8	64.2	60	62	78	70	3.39	.97
Sept .	29.85	.86	62.9	65.8	65.8	85	46	72.1	59.5	57	58	82	78	7.43	2.46
Oct ..	29.84	.79	48.7	52.7	52.0	73	35	58.6	45.4	41	42	76	70	2.53	.67
Nov ..	29.88	1.27	44.6	47.2	46.9	65	27	52.8	41.0	38	38	78	73	9.82	2.92
Dec ..	29.96	1.34	38.1	42.2	41.4	65	13	48.7	34.1	32	34	80	73	1.81	.65
Year .	29.84	1.04	50.2	54.1	53.5	90	2	60.6	46.4	43	45	77	74	58.68	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

NEW LONDON, CONN.

[H=47. T=29. h=58.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
1889.																							
Jan ..	4.4	8.5	58	SE.	W.	10	5	1	3	3	6	20	13	1	11	12	8	10	2	15	0	0	0
Feb ..	4.6	8.3	30	NW.	W.	8	1	1	7	0	4	20	13	2	12	8	8	12	6	26	0	0	0
Mar ..	6.0	9.6	30	N.	NW.	11	10	3	3	3	6	8	13	5	10	7	14	13	0	12	0	2	0
Apr ..	6.4	9.0	35	SE.	NE.	9	12	4	10	5	4	4	10	2	5	16	9	13	0	0	0	4	0
May .	5.2	6.7	30	SE.	SW.†	6	5	8	10	10	10	7	6	0	10	15	6	10	0	0	0	2	0
June .	6.2	6.6	29	SE.	SW.	3	3	2	12	9	18	6	7	0	8	14	8	15	0	0	0	3	0
July .	6.5	7.0	36	S.	S.	6	2	7	7	12	7	5	12	4	8	11	12	15	0	0	0	1	0
Aug ..	5.8	5.4	22	SW.	SW.	9	8	4	1	4	15	6	9	6	10	10	11	11	0	0	0	3	0
Sept .	7.3	8.2	26	SW.	NE.	6	12	5	3	4	11	5	10	4	6	6	18	14	0	0	0	1	0
Oct ..	6.6	7.9	27	NE.	N.	17	9	2	3	2	9	10	9	1	7	10	14	13	0	1	0	2	0
Nov ..	6.7	7.4	54	SE.	W.	7	6	2	4	2	10	15	14	0	6	10	14	16	0	5	0	0	0
Dec ..	5.8	8.0	36	SE.	W.	10	7	2	2	1	7	16	15	2	10	9	12	17	1	15	0	0	0
Year .	6.0	7.7	...	......	NW.	102	80	41	65	55	107	122	131	27	103	128	134	159	9	74	0	18	0

NEW ORLEANS, LA.

[H=52. T=87. h=77.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	6.4	9.4	36	SE.	N.	17	5	6	11	3	4	13	3	0	7	9	15	15	0	0	0	0	0
Feb ..	6.7	9.1	40	S.	NE.	9	12	5	4	8	5	5	7	1	8	3	17	11	0	0	0	0	0
Mar ..	3.2	9.1	35	SW.	NW.†	6	5	6	9	2	13	8	13	0	16	8	7	5	0	0	0	1	0
Apr ..	2.6	8.1	30	S.	N.	12	2	6	10	8	6	8	7	1	19	11	0	5	0	0	0	4	0
May .	2.1	8.1	24	NW.†	S.	9	2	7	8	15	10	4	7	0	23	4	4	5	0	0	0	4	0
June .	4.6	6.9	24	N.	S.	2	6	10	14	16	7	4	0	1	8	9	13	10	0	0	1	4	0
July .	6.0	6.0	32	SW.	SW.	4	4	4	6	10	20	11	2	1	5	20	6	17	0	0	17	6	0
Aug ..	5.2	6.4	24	E.	SE.	5	12	7	18	11	2	2	4	1	11	13	7	16	0	0	6	1	0
Sept .	3.8	6.9	30	SW.	SE.	10	8	10	12	3	8	3	4	2	14	14	2	11	0	0	8	2	0
Oct ..	2.1	7.0	24	N.	N.	23	10	3	4	5	4	1	4	8	26	4	1	2	0	0	0	0	0
Nov .	4.0	8.9	36	SW.	N.	20	5	9	4	8	4	4	5	1	17	6	7	8	0	0	0	0	0
Dec ..	4.0	6.4	23	SE.	SE.	3	6	4	26	10	2	8	1	2	12	15	4	2	0	0	0	0	0
Year .	4.2	7.7	...	......	SE.	120	77	77	126	99	85	71	57	18	166	116	83	107	0	0	32	22	0

NEW YORK CITY.

[H=185. T=183. h=155.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	5.0	12.4	50	SE.	SW.†	2	9	1	4	10	15	15	6	0	3	16	12	11	2	12	0	0	0
Feb ..	5.0	12.7	48	SW.†	W.	3	6	5	1	5	15	16	5	0	1	17	10	12	9	26	0	0	0
Mar ..	6.0	12.3	49	SW.	W.	7	8	0	11	4	10	12	10	0	2	14	15	11	0	8	0	1	0
Apr ..	5.8	10.3	36	SW.	NE.	10	12	4	11	4	6	9	4	0	4	14	12	13	0	0	0	2	0
May .	4.7	8.4	35	NW.	E.	3	3	13	12	8	8	8	6	1	7	16	8	11	0	0	0	2	0
June .	6.2	8.9	36	SE.	SE.	4	4	4	16	12	9	8	2	1	2	21	7	9	0	0	0	6	0
July .	6.2	8.5	35	SW.	SE.	4	5	8	17	5	6	8	9	0	6	10	15	15	0	0	0	1	0
Aug ..	4.5	7.9	25	W.	SE.	8	8	3	15	6	6	11	5	0	11	14	6	11	0	0	0	3	0
Sept .	5.9	12.3	41	N.	N.	10	9	3	11	6	10	6	5	0	10	9	11	15	0	0	0	3	0
Oct ..	6.4	12.1	34	E.	NW.	11	3	3	2	8	8	9	18	0	5	13	13	14	0	0	0	2	0
Nov ..	6.7	11.4	37	SW.	SW.	10	2	1	4	8	18	7	10	0	6	8	16	17	0	4	0	0	0
Dec ..	5.7	11.9	48	SW.	SW.	8	2	1	2	6	22	4	14	3	8	13	10	13	3	9	0	1	0
Year .	5.7	10.8	...	......	SW.	80	71	46	106	82	133	113	94	5	65	165	135	152	14	59	0	21	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

NORFOLK, VA.

[Lat., 36° 51′ N.; Long., 76° 17′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	30.00	1.28	40.8	44.8	44.4	67	24	51.6	37.1	36	39	84	82	4.88	1.70
Feb ..	30.11	1.24	35.3	38.5	38.2	71	16	45.0	31.3	28	26	76	64	4.21	1.80
Mar ..	29.86	1.08	41.2	45.0	45.0	70	29	52.4	37.5	35	36	79	74	7.52	2.50
Apr ..	29.88	1.26	54.1	56.9	56.8	89	36	65.2	48.5	46	45	76	68	11.87	4.60
May .	29.92	.59	65.4	65.6	68.1	93	46	77.7	58.5	57	56	74	73	4.58	1.07
June .	30.00	.66	72.1	73.5	73.9	94	55	81.3	66.5	65	65	79	76	4.75	1.20
July .	29.96	.49	75.7	76.0	77.6	98	63	84.8	70.4	69	69	80	80	10.69	2.34
Aug ..	30.04	.44	71.8	73.2	74.4	90	61	81.4	67.5	67	66	84	80	5.93	2.23
Sept .	29.96	.71	65.9	67.7	68.4	88	46	74.9	61.8	61	62	85	81	5.41	1.40
Oct ..	29.98	.70	54.4	56.8	57.7	81	40	65.0	50.4	48	48	81	73	7.56	3.76
Nov ..	30.06	1.15	49.8	52.6	53.4	78	27	60.9	45.9	44	45	81	76	2.55	.79
Dec ..	30.14	.94	46.6	51.5	51.4	74	28	60.3	42.6	40	40	80	67	.77	.68
Year .	29.99	.88	56.1	58.5	59.1	98	16	66.7	51.5	50	50	80	74	70.72	.....

NORTHFIELD, VT.

[Lat., 44° 10′ N.; Long., 72° 41′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.01	1.52	20.8	24.6	23.7	57	—10	31.2	16.2	16	20	83	82	3.90	1.14
Feb ..	29.06	1.44	6.9	14.2	11.6	48	—32	22.0	1.2	— 1	9	75	78	2.18	.66
Mar ..	28.92	1.50	25.8	30.9	29.5	55	8	38.4	20.6	20	24	80	76	2.05	.72
Apr ..	29.02	1.12	40.9	45.2	43.4	76	18	53.7	33.1	31	33	70	64	1.10	.27
May .	29.00	.69	55.3	58.5	55.9	90	31	67.4	44.4	46	46	71	67	2.48	1.65
June .	29.04	.92	62.9	63.9	62.5	85	34	72.2	52.8	55	56	77	78	5.02	.95
July .	29.04	.64	65.5	66.7	65.0	85	43	74.2	55.8	57	59	76	78	4.65	1.40
Aug ..	29.12	.61	61.1	61.8	61.3	83	40	72.2	50.4	56	56	82	81	1.59	.39
Sept .	29.12	1.00	55.0	57.1	57.4	83	30	66.8	47.9	51	52	86	83	4.06	.94
Oct ..	29.11	.96	38.3	39.7	40.2	63	12	49.0	31.4	34	34	84	80	3.57	1.17
Nov ..	29.10	1.20	34.8	36.2	35.8	58	12	42.3	29.4	30	30	84	80	3.45	.93
Dec ..	29.14	1.56	23.8	28.3	26.6	55	—12	35.4	17.9	18	22	80	78	2.61	.61
Year.	29.06	1.10	40.9	43.9	42.7	90	—32	52.1	33.4	34	37	79	77	36.66	.....

NORTH PLATTE, NEBR.

[Lat., 41° 8′ N.; Long., 100° 45′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	27.09	.88	11.6	23.7	20.5	48	— 9	32.4	8.6	6	16	78	72	0.97	0.44
Feb ..	27.14	1.07	18.0	28.4	26.6	56	— 6	37.6	15.5	10	16	72	61	0.07	0.04
Mar ..	27.11	.88	29.3	47.0	40.9	69	9	54.5	27.3	22	27	73	48	0.62	0.26
Apr ..	27.10	.96	42.1	57.0	50.6	84	24	62.1	39.2	35	35	76	49	2.65	0.78
May .	27.03	1.23	47.6	64.0	56.3	89	25	69.1	43.5	40	41	78	47	2.71	1.20
June .	27.07	.60	58.5	72.7	66.6	91	42	79.0	54.2	53	54	83	55	1.95	0.90
July .	27.08	.53	63.8	77.8	71.7	102	42	83.9	59.5	58	59	83	57	6.01	2.70
Aug ..	27.11	.60	62.9	76.9	72.3	96	47	84.1	60.5	56	61	80	59	2.06	0.66
Sept .	27.10	.83	48.0	65.7	59.8	90	31	74.3	45.2	41	44	79	49	2.57	2.24
Oct ..	27.18	.62	40.4	53.7	49.8	88	23	62.5	37.2	35	38	83	59	0.31	0.18
Nov ..	27.19	.84	22.5	36.1	33.2	62	2	46.7	19.7	17	22	79	57	0.20	0.10
Dec ..	27.04	.89	26.9	37.8	37.2	70	6	51.0	23.4	20	23	74	58	0.54	0.54
Year .	27.10	.83	39.3	53.4	48.8	102	— 9	61.4	36.2	33	36	78	56	20.66	.....

Monthly and Yearly Meteorological Summaries—Continued.

NORFOLK, VA.

[H=69. T=87. h=79.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
1889.																							
Jan ..	5.2	8.7	42	SW.	SW.	7	10	6	10	6	11	4	7	1	8	10	13	9	0	6	0	0	0
Feb ..	6.0	9.1	48	W.	N.	11	8	0	6	3	9	9	10	0	6	10	12	9	2	13	0	1	0
Mar ..	5.5	10.9	35	NE.	NW.	5	11	3	9	3	9	4	17	1	7	12	12	11	0	2	0	0	0
Apr ..	5.2	10.8	55	N.	SE.	5	7	1	13	10	9	5	10	0	8	8	14	15	0	0	0	1	0
May ..	5.0	7.7	50	W.	NW.	7	10	7	6	6	6	6	13	1	12	10	9	13	0	0	3	9	0
June ..	7.1	8.8	34	SE.	S.	3	5	3	8	19	13	1	7	1	2	13	15	15	0	0	1	5	0
July ..	6.6	7.3	52	NW.	SW.	4	5	2	14	9	17	0	6	5	5	11	15	20	0	0	5	6	0
Aug ..	6.2	7.1	30	W.	SW.	5	9	1	11	11	13	2	6	4	8	7	16	20	0	0	0	5	0
Sept ..	6.2	9.0	48	NW.	NW.	3	7	3	13	6	3	4	13	8	8	10	12	17	0	0	0	1	0
Oct ..	5.3	9.1	42	SW.	NW.	7	6	4	4	11	11	0	15	4	12	9	10	12	0	0	0	0	0
Nov ..	5.5	8.2	30	W.	SW.	4	7	2	6	6	22	5	4	4	10	10	10	11	0	2	0	0	0
Dec ..	4.7	8.1	30	SW.	SW.	6	3	8	6	11	17	6	4	1	13	9	9	4	0	3	0	0	0
Year .	5.7	8.7	..	.....	SW.	67	88	40	106	101	140	46	112	30	99	119	147	156	2	26	9	28	0

NORTHFIELD, VT.

[H=871. T=16. h=2.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
Jan ..	6.5	8.4	48	SW.	S.	11	9	4	0	19	7	6	1	5	4	10	17	17	14	30	0	0	0
Feb ..	5.8	9.2	40	SW.	S.	11	5	0	0	21	8	5	0	6	3	9	16	16	23	28	0	0	0
Mar ..	6.3	8.3	45	N.	S.	16	10	0	1	18	9	1	2	5	4	10	17	11	9	28	0	0	0
Apr ..	5.8	8.9	40	W.	S.	11	6	1	1	22	7	1	1	10	5	10	15	12	0	16	0	0	0
May ..	5.7	8.7	45	N.	S.	11	6	1	1	27	10	1	5	0	6	12	13	10	0	1	0	2	0
June ..	7.3	7.5	40	NW.	S.	7	3	3	1	27	12	1	0	6	2	9	19	19	0	0	0	5	0
July ..	7.0	7.5	30	N.	S.	9	4	2	2	26	7	4	5	3	3	8	20	17	0	0	0	4	0
Aug ..	5.6	6.0	28	S.	S.	3	5	4	0	30	11	3	0	6	7	13	11	13	0	0	0	2	0
Sept ..	7.0	6.3	36	N.	S.	6	4	5	1	27	6	4	2	5	5	8	17	16	0	1	0	1	0
Oct ..	7.0	7.0	30	N.	S.	12	7	3	1	17	7	4	2	9	4	10	17	15	0	16	0	0	2
Nov ..	8.0	7.6	36	N.	S.	9	4	3	2	21	12	4	1	4	1	9	20	14	0	15	0	0	2
Dec ..	7.3	10.2	48	NW.	S.	13	2	1	1	25	8	2	8	2	1	13	17	14	10	26	0	0	0
Year .	6.6	8.0	..	.....	S.	119	65	27	11	280	104	36	27	61	45	121	199	174	56	161	0	14	4

NORTH PLATTE, NEBR.

[H=2,841. T=45. h=34.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
Jan ..	3.1	8.1	37	N.	W.	4	1	6	4	4	1	24	18	0	13	12	6	6	14	31	0	0	0
Feb ..	4.4	9.4	48	NW.	NW.	8	3	7	6	3	8	8	13	0	6	18	4	3	7	27	0	0	0
Mar ..	3.8	8.6	30	NW.†	N.	15	4	9	7	6	1	12	8	0	9	18	4	4	0	21	0	0	0
Apr ..	5.2	11.4	42	N.	SE.	9	6	10	12	4	3	8	8	0	9	9	12	9	0	2	0	2	0
May ..	5.5	10.8	38	SW.	N.	13	3	7	12	5	4	8	10	0	4	17	10	12	0	1	0	2	0
June ..	4.8	8.8	60	S.	SE.	8	1	3	16	10	2	7	13	0	5	17	8	14	0	0	1	4	0
July ..	4.9	9.7	48	E.	SE.	7	5	12	20	4	2	6	5	1	9	14	8	10	0	0	6	7	0
Aug ..	4.5	9.6	38	N.	SE.	3	4	18	27	3	2	1	4	0	10	18	3	8	0	0	4	1	0
Sept ..	4.6	9.9	37	SE.	SE.	9	5	10	13	3	0	12	8	0	14	8	8	6	0	2	0	1	0
Oct ..	5.3	8.5	34	NW.	SE.	12	3	12	12	5	1	11	6	0	8	15	8	4	0	5	0	0	0
Nov ..	5.1	8.5	4	N.	W.	5	0	1	4	7	9	23	11	0	7	17	6	5	2	28	0	0	0
Dec ..	5.2	7.2	48	NW.	W.	2	5	5	11	7	8	15	9	0	8	21	2	2	0	29	0	0	0
Year .	4.7	9.2	..	.....	SE.	95	40	100	144	61	41	135	113	1	102	184	79	83	23	146	11	17	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

OLYMPIA, WASH.

[Lat., 47° 37′ N.; Long., 122° 53′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	30.06	.91	35.0	41.1	37.6	50	22	43.0	32.1	33	36	93	84	4.05	.84
Feb ..	30.14	.80	39.5	47.5	43.6	62	26	50.6	36.7	38	40	94	76	1.40	.52
Mar ..	29.90	1.24	42.5	55.9	49.8	73	31	59.6	40.0	41	46	93	72	3.91	1.15
Apr ..	29.98	.78	42.3	59.7	52.8	79	31	66.3	39.3	40	46	91	63	1.89	.51
May .	29.92	.90	47.9	65.2	57.2	89	35	69.0	45.4	46	47	92	56	2.42	1.17
June .	29.98	.59	48.7	72.8	61.0	90	40	75.2	46.9	46	57	89	59	1.32	.39
July .	29.96	.56	51.7	77.8	64.9	90	42	79.5	50.3	49	60	92	56	.02	.02
Aug ..	29.98	.61	50.4	69.8	60.7	81	42	72.5	48.9	49	57	95	64	1.99	1.03
Sept .	30.04	.77	47.0	65.9	56.2	85	34	68.2	44.2	45	54	95	67	3.52	2.12
Oct ..	29.91	.97	47.9	59.4	54.0	74	37	62.2	45.8	47	55	96	86	4.30	1.87
Nov ..	30.04	1.04	42.6	48.4	46.0	60	29	52.3	39.6	42	46	96	92	4.79	1.04
Dec ..	29.84	1.08	34.6	39.5	36.9	51	21	41.7	32.1	34	37	97	92	4.14	.80
Year .	29.98	.85	44.2	58.6	51.7	90	20	61.7	41.8	42	48	94	72	33.75	.....

OMAHA, NEBR.

[Lat., 41° 16′ N.; Long., 95° 56′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	28.88	1.07	18.5	27.0	24.0	47	—2	32.2	15.8	14	20	80	76	1.62	0.78
Feb ..	28.99	1.41	17.1	25.1	23.0	53	—10	32.6	13.5	11	16	77	70	0.23	0.21
Mar ..	28.89	.84	32.6	47.8	42.5	71	17	54.2	30.8	24	31	72	56	0.53	0.32
Apr ..	28.86	1.06	45.8	59.0	54.0	80	32	64.8	43.3	35	32	66	42	1.19	0.49
May .	28.76	.99	56.1	67.2	62.5	90	37	72.5	52.5	45	42	67	44	2.67	1.12
June .	28.81	.76	63.1	74.3	69.5	90	44	79.9	59.1	54	56	74	55	5.44	2.02
July .	28.80	.47	68.6	78.1	74.8	94	56	81.0	65.7	62	64	81	65	4.94	1.87
Aug ..	28.88	.43	66.0	77.0	74.0	92	56	81.6	64.3	60	64	82	64	2.90	1.60
Sept .	28.85	.78	55.5	66.1	63.6	88	38	74.4	52.9	50	52	82	63	1.74	0.82
Oct ..	28.96	.69	43.6	54.7	52.2	84	28	62.0	42.4	37	39	78	57	0.34	0.19
Nov ..	28.97	.99	28.3	37.1	35.3	60	7	43.9	26.7	23	26	82	65	0.87	0.85
Dec ..	28.85	1.30	33.7	41.4	39.4	68	10	48.1	30.8	27	29	77	64	0.50	0.41
Year .	28.88	.90	44.1	54.6	51.2	94	—10	61.0	41.5	37	39	76	60	22.97	.....

OSWEGO, N. Y.

[Lat., 43° 29′ N.; Long., 76° 35′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.62	1.45	27.0	29.3	28.8	53	1	34.7	22.9	22	24	84	82	4.25	1.43
Feb ..	29.70	1.44	16.8	20.4	18.0	42	—5	24.6	11.3	13	16	87	82	2.17	0.49
Mar ..	29.56	1.24	31.0	32.8	31.6	58	20	36.5	26.8	24	25	76	75	0.55	0.36
Apr ..	29.62	1.24	42.2	43.9	43.3	82	28	50.3	36.3	34	33	76	69	2.85	0.96
May .	29.57	.61	55.5	55.7	55.2	90	35	63.3	47.0	47	46	74	73	1.61	0.43
June .	29.62	.88	60.2	61.7	61.0	83	43	68.7	53.2	55	55	84	80	9.81	2.80
July .	29.60	.65	68.0	69.6	69.0	87	52	75.5	62.4	63	63	84	79	3.02	0.91
Aug ..	29.69	.64	64.4	66.8	65.8	86	51	73.0	58.6	59	60	82	79	1.02	0.53
Sept .	29.66	.97	59.6	62.9	61.4	84	42	68.1	54.6	54	54	81	75	2.52	0.62
Oct ..	29.68	1.00	42.3	45.1	43.9	67	24	49.5	38.3	37	37	82	75	3.57	1.08
Nov ..	29.66	1.26	38.3	40.8	39.6	63	20	44.5	34.6	34	36	84	83	5.43	1.39
Dec ..	29.70	1.53	34.1	35.7	34.7	60	6	41.2	28.2	28	30	78	82	3.30	0.80
Year .	29.64	1.08	45.0	47.1	46.0	90	—5	52.5	39.5	39	40	81	78	40.10	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

OLYMPIA, WASH.

[H=36. T=40. h=41.]

Month and year.	Mean cloudiness (in tenths).	Wind.														Number of days.								
		Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	7.4	3.9	17	S.	S.	5	4	3	8	32	2	2	0	6	3	10	18	18	0	13	0	0	0
Feb ..	6.6	3.2	22	NE.	S.	5	5	1	3	16	9	1	7	9	5	11	12	9	0	3	0	0	0
Mar ..	6.2	2.9	20	SW.	N.†	14	6	3	5	14	7	8	3	2	9	8	14	19	0	1	0	0	0
Apr ..	6.3	3.6	18	SW.	S.	3	7	5	6	16	4	8	9	2	10	6	14	13	0	1	0	1	0
May .	5.4	3.8	20	SW.	N.	15	3	2	6	9	11	9	4	3	10	10	11	12	0	0	0	0	0
June .	3.2	3.8	16	SW.	N.	14	10	4	2	10	5	7	7	1	20	3	7	6	0	0	0	0	0
July .	2.2	3.4	14	W.	N.	27	5	4	3	4	6	9	4	0	23	6	2	1	0	0	0	0	0
Aug .	3.2	3.0	16	W.	N.	21	3	2	3	12	5	11	4	1	21	2	8	7	0	0	0	0	0
Sept .	3.5	3.3	16	S.	S.	12	8	1	1	15	6	9	5	3	17	6	7	7	0	0	0	0	0
Oct ..	6.4	2.8	20	S.	S.	11	3	0	0	30	3	5	9	1	8	8	15	18	0	0	0	0	0
Nov ..	7.2	3.8	34	S.	S.	9	5	1	0	35	3	4	2	1	5	9	16	18	0	1	0	0	0
Dec ..	7.3	3.5	24	S.	S.	6	3	2	8	39	1	2	0	1	6	6	19	17	0	13	0	0	0
Year .	5.4	3.4	...	.....	S.	142	62	28	45	232	62	75	54	30	137	85	143	145	0	32	0	1	0

OMAHA, NEBR.

[H=1,113. T=88. h=82.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	4.1	8.3	38	NW.	NW.	8	1	2	4	12	7	2	21	5	12	7	12	7	15	31	0	0	0
Feb ..	4.6	10.1	49	NW.	NW.	7	2	2	7	8	4	4	21	1	6	10	12	3	12	24	0	0	0
Mar ..	4.4	8.1	30	N.	N.	19	5	0	11	5	2	4	16	0	9	14	8	4	2	18	0	0	0
Apr ..	5.8	9.5	43	NW.	SE.†	13	2	4	13	10	0	3	12	3	7	10	13	10	0	0	0	0	0
May .	5.6	10.0	40	S.	N.	18	4	0	5	14	2	0	13	6	9	12	10	11	0	0	0	2	0
June .	4.0	6.9	32	N.	S.	12	1	1	15	17	5	0	7	2	13	12	5	8	0	0	0	1	0
July .	5.8	7.2	36	W.	S.	7	2	2	12	18	3	4	12	2	9	12	10	12	0	0	4	3	0
Aug ..	4.0	7.0	30	S.	S.	5	2	1	9	33	0	0	9	3	14	12	5	7	0	0	3	1	0
Sept .	5.1	7.5	33	SE.	S.	7	0	1	10	22	2	4	10	4	11	8	11	7	0	0	0	1	0
Oct ..	4.8	6.8	34	NW.	S.	7	3	5	14	14	2	1	12	4	13	8	10	4	0	2	0	0	0
Nov ..	4.7	8.4	35	NW.	NW.	5	0	2	8	14	2	7	20	2	11	11	8	2	4	23	0	0	0
Dec ..	6.4	8.7	42	NW.	S.	6	0	2	8	23	5	2	15	1	7	10	14	5	2	15	0	0	0
Year .	4.9	8.2	...	.....	S.	114	22	22	116	190	34	31	168	33	121	126	118	80	35	113	7	8	0

OSWEGO, N. Y.

[H=335. T=76. h=83.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	7.6	13.6	48	W.	SE.	1	8	1	14	10	7	9	12	0	3	6	22	16	11	26	0	0	0
Feb ..	9.1	15.6	38	SW.	SE.	2	2	2	14	9	8	9	9	1	2	5	21	22	21	27	0	0	0
Mar ..	6.6	10.2	36	NW.	NW.	8	8	1	9	2	6	11	15	2	6	7	18	9	5	25	0	0	0
Apr ..	5.0	9.2	33	S.	W.	9	6	1	7	7	4	18	6	2	10	7	13	11	0	8	0	3	0
May .	6.6	8.7	32	SE.	W.	7	1	3	10	7	7	18	4	5	7	10	14	13	0	0	0	1	0
June .	6.4	7.8	25	W.	W.	5	0	4	9	11	11	12	5	3	6	8	16	16	0	0	0	7	0
July .	4.7	8.2	26	N.	W.	5	0	1	18	7	3	18	7	3	11	12	8	15	0	0	0	6	0
Aug ..	4.5	7.6	21	W.	W.	6	1	4	10	12	10	13	5	1	12	10	9	9	0	0	0	3	0
Sept .	5.4	9.8	27	SW.	SE.	5	4	2	18	13	4	5	8	1	9	9	12	11	0	0	0	1	0
Oct ..	7.2	10.9	32	N.	NE.	10	14	3	13	7	3	5	7	0	7	3	21	13	0	4	0	2	0
Nov ..	8.2	10.7	29	NW.	SE.	4	1	2	16	11	4	12	8	2	1	5	24	16	3	10	0	0	0
Dec ..	7.6	14.6	52	W.	S.	3	2	4	13	13	8	9	8	2	4	5	22	19	6	19	0	2	0
Year .	6.6	10.6	...	.....	SE.	65	47	28	151	109	75	139	94	22	78	87	200	170	46	119	0	25	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

PALESTINE, TEX.

[Lat., 31° 45′ N.; Long., 95° 40′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	29.55	.76	43.1	51.2	49.0	70	25	58.8	39.3	40	44	89	79	6.82	1.69
Feb ..	29.63	.77	44.8	56.0	51.9	80	24	61.7	42.1	40	45	83	68	4.02	1.17
Mar ..	29.47	.89	51.2	63.1	58.6	82	38	69.3	47.9	45	48	81	61	4.53	1.67
Apr ..	29.46	.59	61.6	73.3	68.8	87	50	79.2	58.4	56	59	84	62	2.31	.72
May .	29.47	.56	66.1	75.5	71.4	88	48	81.7	61.1	61	65	84	71	3.47	2.44
June .	29.46	.41	72.0	78.4	76.6	91	55	85.3	68.0	69	71	90	79	7.00	1.94
July .	29.46	.30	78.1	85.6	83.1	99	70	92.1	74.2	75	76	90	74	2.21	.64
Aug ..	29.51	.25	75.4	84.2	81.8	99	65	91.5	72.0	72	73	88	71	1.77	.94
Sept .	29.52	.62	66.6	72.6	71.9	90	53	80.7	63.0	63	65	90	78	4.73	1.27
Oct ..	29.56	.56	57.1	69.9	66.5	89	38	78.5	54.5	54	60	88	69	1.21	1.20
Nov ..	29.61	.90	44.3	54.6	51.2	77	28	61.1	41.4	40	43	87	67	7.97	1.74
Dec ..	29.64	.66	58.5	65.5	64.0	80	31	72.5	55.5	56	56	91	74	0.39	.30
Year .	29.53	.61	59.9	69.2	66.2	99	24	76.0	56.4	56	59	87	71	46.43	.....

PARKERSBURGH, W. VA.

[Lat., 39° 16′ N.; Long., 81° 36′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.38	1.22	33.3	37.1	36.4	60	17	43.4	29.5	28	31	80	78	3.03	0.82
Feb ..	29.48	1.23	26.6	31.0	30.0	61	4	36.8	23.1	22	25	82	79	2.88	1.17
Mar ..	29.30	.87	37.8	45.3	43.2	74	24	52.4	33.9	32	37	82	74	1.66	0.50
Apr ..	29.34	.93	48.7	54.5	52.6	85	23	62.6	42.7	42	44	78	70	2.72	1.16
May .	29.32	.62	58.2	64.6	62.4	91	32	73.8	50.9	50	52	76	67	2.80	1.49
June .	29.38	.63	66.1	69.5	68.4	87	42	77.0	59.9	60	62	80	77	4.03	1.12
July .	29.34	.48	70.4	76.0	74.2	94	54	83.8	64.7	65	68	84	77	7.66	3.00
Aug ..	29.44	.46	65.2	71.7	70.1	89	48	80.7	59.5	61	64	86	76	1.54	0.52
Sept .	29.40	.74	59.5	64.6	64.0	89	35	73.3	54.8	55	59	85	82	3.12	1.81
Oct ..	29.43	.61	41.2	50.9	50.0	77	24	59.7	40.3	40	43	85	75	1.87	0.71
Nov ..	29.42	1.19	39.9	43.4	43.5	76	23	51.1	35.9	35	38	85	81	4.96	0.88
Dec ..	29.50	.80	43.8	47.9	47.2	69	16	56.9	37.5	37	41	78	79	1.89	0.60
Year .	29.39	.82	49.5	54.7	53.5	94	4	62.6	44.4	44	47	82	76	38.16	.....

PENSACOLA, FLA.

[Lat., 30° 25′ N.; Long., 87° 13′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	30.02	.66	48.7	54.2	52.7	70	33	59.3	46.1	43	47	80	78	6.46	2.39
Feb ..	30.14	.68	47.5	53.6	51.9	70	29	58.6	45.2	42	45	82	75	3.03	1.18
Mar ..	29.94	.80	54.2	60.4	58.8	76	37	66.4	51.1	48	52	79	74	5.99	3.02
Apr ..	29.96	.69	64.6	68.0	67.8	86	48	75.5	60.0	57	60	77	77	0.94	0.84
May .	29.99	.53	70.2	72.5	71.4	88	47	78.8	63.9	60	61	70	68	2.06	0.95
June .	29.98	.41	76.5	77.8	77.2	90	55	83.0	71.5	70	71	80	80	4.04	2.00
July .	29.96	.28	79.9	80.5	80.8	94	69	86.8	74.7	76	75	87	84	10.78	2.98
Aug ..	30.00	.26	77.0	80.9	79.2	89	67	85.7	72.7	72	72	85	76	6.95	2.91
Sept .	29.94	.64	74.1	78.8	77.3	93	54	84.9	69.7	67	69	79	74	4.70	2.40
Oct ..	30.02	.52	62.1	69.3	67.2	84	47	75.6	58.7	54	58	76	69	1.79	1.13
Nov ..	30.08	.81	53.5	60.4	58.6	78	32	67.0	50.1	48	52	84	75	5.82	3.55
Dec ..	30.19	.44	56.1	63.2	62.0	76	35	70.2	53.9	54	60	94	90	0.18	0.15
Year .	30.02	.56	63.7	68.3	67.1	94	29	74.3	59.8	58	60	81	77	52.74	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

PALESTINE, TEX.

[H=511. T=42. h=38.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan	6.0	6.3	30	W.	N.	15	1	8	11	10	2	8	6	1	8	7	16	16	0	4	0	0	0
Feb	6.2	6.2	23	S.	SE.	8	11	7	12	5	2	2	9	0	5	9	14	11	0	3	0	1	0
Mar	4.6	6.9	27	NW.	S.	12	6	2	8	13	3	5	11	2	11	9	11	9	0	0	0	1	0
Apr	3.8	6.0	29	W.	S.	7	4	6	11	15	8	1	4	4	12	12	6	8	0	0	0	1	0
May	4.0	6.7	40	W.	SE.	12	6	8	16	11	3	1	3	2	15	10	6	7	0	0	0	1	0
June	5.8	4.6	32	W.	S.	4	14	7	9	15	3	3	3	2	11	13	6	15	0	0	1	1	0
July	4.2	4.7	23	SE.	S.	0	5	4	14	25	11	1	0	2	16	11	4	9	0	0	23	1	0
Aug	2.7	3.9	30	N.	E.	4	12	31	5	6	0	1	1	2	19	9	3	9	0	0	19	0	0
Sept	5.7	5.0	18	NW.	NE.	5	14	8	9	6	0	2	3	5	10	2	14	11	0	0	0	0	0
Oct	3.1	5.4	32	SE.	SE.	0	13	11	14	4	4	4	5	7	16	10	5	2	0	0	0	1	0
Nov	4.7	6.5	26	W.	NW.	3	6	8	5	7	3	9	17	2	13	5	12	9	0	3	0	2	0
Dec	7.3	7.2	26	S.	SW.	2	4	5	16	14	19	1	0	1	1	14	16	4	0	1	0	0	0
Year	4.8	5.8	..	.....	S.	72	96	105	130	131	58	38	62	30	137	111	113	110	0	11	43	9	0

PARKERSBURGH, W. VA.

[H=638. T=76. h=67.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	5.9	6.1	36	SW.	SW.	6	3	2	8	10	12	5	5	11	8	8	15	12	3	18	0	0	0
Feb	5.8	7.5	31	W.	W.	6	0	3	6	7	11	13	10	0	8	8	12	12	9	23	0	0	0
Mar	5.7	5.9	29	W.	NW.†	5	4	1	5	7	5	14	14	7	10	9	12	9	0	10	0	0	0
Apr	5.0	6.4	36	NW.	NW.	11	2	5	4	4	8	6	15	5	12	8	10	8	0	1	0	2	0
May	4.1	4.9	34	W.	S.	3	4	0	5	14	9	9	7	11	16	8	7	9	0	0	1	3	0
June	6.2	4.6	25	S.	SW.	1	6	1	1	13	18	7	7	6	5	15	10	18	0	0	0	3	0
July	4.2	3.6	24	SW.	S.	9	1	3	4	14	11	6	6	8	15	9	7	13	0	0	3	6	0
Aug	3.1	3.4	29	W.	S.	12	9	1	2	13	7	5	4	9	18	10	3	7	0	0	0	2	0
Sept	3.7	4.6	21	W.	S.	9	2	3	4	19	2	4	9	8	15	10	5	10	0	0	0	0	0
Oct	5.3	5.2	24	NW.	NW.	6	7	2	9	9	3	2	18	6	13	7	11	8	0	3	0	1	0
Nov	6.9	5.8	27	SW.	SW.	1	8	2	2	10	11	5	8	13	6	10	14	18	2	8	0	0	0
Dec	5.1	6.4	42	SW.	S.	2	7	0	4	17	13	3	5	11	13	6	12	9	0	12	0	0	0
Year	5.1	5.4	..	.....	S.	71	53	23	54	137	110	79	108	95	139	108	118	133	14	75	4	17	0

PENSACOLA, FLA.

[H=56. T=79. h=80.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	6.6	10.0	36	NW.	NE.	11	20	6	7	2	1	2	13	0	5	8	18	14	0	0	0	1	0
Feb	5.8	9.8	35	SE.	NE.	9	16	6	6	3	5	3	8	0	4	11	13	11	0	1	0	0	0
Mar	3.7	10.6	42	SE.	NW.	11	9	2	6	1	10	9	14	0	15	12	4	6	0	0	0	1	0
Apr	2.4	9.6	36	SE.	N.	16	6	2	5	6	8	13	4	0	21	8	1	2	0	0	0	1	0
May	2.2	9.6	30	SW.	SW.	13	5	3	3	3	18	7	10	0	22	7	2	5	0	0	0	2	0
June	5.0	8.8	26	SW.	SW.	1	10	6	10	9	15	6	3	0	7	14	9	11	0	0	0	4	0
July	5.4	7.6	34	SW.	SW.	5	8	3	2	2	15	13	12	2	7	16	8	16	0	0	6	16	0
Aug	4.8	7.7	28	S.	NE.	5	19	4	14	4	11	3	2	0	15	8	8	13	0	0	0	8	0
Sept	4.2	8.8	40	SE.	NE.	9	16	0	13	5	9	3	5	0	15	13	2	8	0	0	3	5	0
Oct	3.9	8.7	38	SW.	NE.	8	19	1	7	2	14	1	10	0	19	9	3	5	0	0	0	1	0
Nov	4.1	9.4	46	SW.	NW.	12	11	3	9	1	2	4	17	1	17	3	10	11	0	1	0	1	0
Dec	3.5	5.9	25	N.	SW.	3	9	8	10	2	22	2	4	2	15	9	7	3	0	0	0	0	0
Year	4.3	8.9	..	.....	NE.	103	148	44	92	40	139	66	102	5	162	118	85	105	0	2	9	40	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

PHILADELPHIA, PA.

[Lat., 39° 57′ N.; Long., 75° 9′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan..	29.94	1.44	35.7	38.9	38.7	59	18	45.0	32.4	29	29	76	68	3.75	1.08
Feb..	30.05	1.41	25.6	30.8	29.5	51	2	35.9	23.1	17	20	71	66	2.00	0.94
Mar..	29.80	1.05	38.7	43.6	42.2	66	25	49.4	35.1	29	32	69	66	2.58	1.03
Apr..	29.86	1.22	49.3	54.0	53.2	78	34	61.6	44.8	39	42	70	67	3.17	1.53
May.	29.86	.73	60.7	65.4	64.7	90	43	74.1	55.3	51	56	71	72	4.32	1.25
June.	29.94	.78	68.2	71.4	71.4	88	54	79.4	63.3	60	62	76	72	3.39	1.35
July.	29.88	.59	72.7	74.9	75.3	94	60	83.1	67.5	65	66	78	74	8.29	3.00
Aug..	29.98	.54	69.3	72.9	72.8	88	57	80.9	64.7	61	62	76	70	7.07	2.78
Sept.	29.93	.80	63.2	64.6	66.4	87	47	73.5	59.4	58	57	82	78	4.66	[illegible]
Oct..	29.94	.84	49.1	52.7	52.8	79	32	60.1	45.4	42	42	77	68	3.76	1.55
Nov..	29.98	1.24	44.9	46.9	47.0	65	27	53.2	40.8	39	38	80	73	6.76	1.68
Dec..	30.07	1.27	39.6	44.2	43.6	68	16	51.0	36.1	32	34	75	69	0.85	0.20
Year.	29.94	.99	51.4	55.0	54.8	94	2	62.3	47.3	44	45	75	70	50.60	.....

PITTSBURGH, PA.

[Lat., 40° 32′ N.; Long., 80° 2′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan..	29.11	1.40	33.6	36.8	36.5	61	17	42.7	30.3	27	28	78	71	2.50	0.74
Feb..	29.20	1.30	25.6	29.0	28.0	53	− 1	34.9	21.2	19	20	77	69	1.58	0.67
Mar..	29.04	.89	37.8	45.0	43.2	70	23	51.3	35.1	29	30	72	60	2.32	0.96
Apr..	29.10	.99	47.7	53.8	52.4	83	25	61.2	43.5	37	39	68	60	3.62	0.95
May.	29.06	.59	58.5	64.7	62.4	90	37	72.2	52.5	47	48	68	58	6.45	2.96
June.	29.12	.69	65.2	69.4	68.2	87	46	76.1	60.4	56	58	72	68	4.93	1.75
July.	29.10	.54	70.5	76.0	74.6	93	56	83.8	65.4	62	61	74	60	5.48	1.45
Aug..	29.20	.55	65.2	72.6	70.2	89	50	80.3	60.0	57	58	76	61	1.88	0.86
Sept.	29.15	.72	61.5	66.6	65.6	90	44	73.6	57.5	54	56	77	69	2.87	1.40
Oct..	29.16	.64	46.4	51.8	51.0	75	30	59.3	42.7	40	42	80	71	2.06	0.64
Nov..	29.15	1.18	42.0	45.2	43.5	69	20	49.7	37.3	38	38	84	78	4.61	1.11
Dec..	29.22	1.01	44.0	46.3	45.6	67	22	53.5	37.8	38	37	79	72	3.07	0.87
Year.	29.13	.88	49.8	54.8	53.4	93	− 1	61.6	45.3	42	43	75	66	41.37	.....

PORT ANGELES, WASH.

[Lat., 48° 7′ N.; Long., 123° 6′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan..	30.04	1.11	33.4	37.8	37.5	50	26	43.1	31.9	31	32	91	80	2.96	.92
Feb..	30.14	.78	36.0	43.2	40.6	54	29	46.2	35.1	33	37	88	79	.99	.42
Mar..	29.90	1.23	39.1	50.1	45.6	59	30	53.2	38.1	36	44	69	81	2.43	.56
Apr..	29.98	.80	40.8	53.4	48.0	64	32	56.7	39.3	37	46	86	76	2.49	.98
May.	29.92	1.01	45.6	56.7	52.2	72	38	60.7	43.7	42	50	88	78	1.53	.64
June.	30.00	.56	47.2	59.9	55.0	76	37	64.3	45.7	44	52	91	76	.94	.54
July.	30.00	.55	50.5	61.2	56.4	83	41	64.2	48.6	48	50	91	68	00	.00
Aug..	29.98	.71	49.4	59.9	55.2	70	42	62.8	47.6	48	52	96	77	1.58	.76
Sept.	30.04	.78	44.9	57.4	51.2	72	32	60.2	42.3	44	50	97	76	2.35	1.10
Oct..	29.90	.93	45.8	52.0	49.6	64	32	55.7	43.6	45	49	90	90	3.33	.64
Nov..	30.03	1.19	38.9	43.6	43.3	60	30	50.2	36.4	38	41	97	90	3.20	.88
Dec..	29.84	1.00	33.8	36.0	36.3	48	28	41.6	31.0	33	34	98	93	5.78	1.38
Year.	29.98	.89	42.1	50.9	47.6	83	26	54.9	40.3	40	45	93	80	27.58	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

PHILADELPHIA, PA.

[H=117. T=168. h=166.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	4.6	11.3	48	NE.	NW.†	0	9	3	7	4	5	17	17	0	13	6	12	11	0	13	0	0	0
Feb ..	5.4	11.0	36	NW.	NW.	0	11	2	2	1	6	10	23	1	3	12	13	10	6	26	0	0	0
Mar ..	5.2	14.0	42	NE.	NW.	1	18	0	3	2	10	7	19	2	11	5	15	12	0	7	0	0	0
Apr ..	6.5	13.6	48	NE.†	NE.	4	17	2	7	3	9	7	11	0	6	8	16	13	0	0	0	2	0
May .	5.2	9.8	60	NW.	NW.	0	13	3	11	2	12	6	15	0	8	11	12	16	0	0	0	3	0
June .	7.2	10.5	46	SE.	SW.	0	10	0	7	3	22	6	12	0	2	13	15	14	0	0	0	3	0
July .	6.8	9.7	33	SW.	NW.	3	8	3	13	4	14	5	12	0	6	9	16	17	0	0	2	3	0
Aug ..	5.4	9.3	25	SW.	SW.	4	15	3	4	1	17	7	11	0	13	6	12	12	0	0	0	5	0
Sept .	6.5	12.9	54	NE.	NE.	1	18	7	5	1	9	3	15	1	7	6	17	17	0	0	0	2	0
Oct ..	6.0	11.5	38	NE.	NW.	4	15	1	3	2	13	4	18	2	10	7	14	13	0	1	0	2	0
Nov ..	6.5	10.2	26	NW.	NW.	2	9	4	4	2	6	13	17	3	7	7	16	15	0	4	0	0	0
Dec ..	5.2	10.4	44	W.	SW.	1	8	7	2	1	20	9	14	0	11	9	11	10	1	8	0	0	0
Year .	5.9	11.2	..	......	NW.	20	151	35	68	26	143	94	184	9	97	99	169	160	7	59	2	20	0

PITTSBURGH, PA.

[H=847. T=130. h=126.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	6.3	6.6	32	SW.	W.	7	10	2	6	4	7	16	9	1	4	8	19	14	4	18	0	0	0
Feb ..	7.5	7.4	33	W.	W.	6	8	4	4	6	6	11	10	1	1	12	15	16	11	23	0	0	0
Mar ..	6.0	5.0	36	W.	NW.	12	7	7	0	3	5	5	16	7	6	10	15	15	0	8	0	1	0
Apr ..	5.7	5.5	32	W.	NW.	13	9	3	2	3	2	10	16	2	6	12	12	13	0	1	0	3	0
May .	6.0	5.0	23	W.	NW.	8	2	4	6	6	5	9	22	0	7	9	15	14	0	0	0	3	0
June .	7.8	5.6	24	SW.	SW.	6	7	2	5	11	17	7	5	0	1	8	21	18	0	0	0	9	0
July .	6.5	3.9	26	S.	N.	16	9	5	1	6	7	5	13	0	6	10	15	13	0	0	4	13	0
Aug ..	5.6	3.9	20	SW.	N.	18	4	4	0	4	10	4	14	4	9	15	7	6	0	0	0	5	0
Sept .	5.9	5.1	24	NW.	NE.†	11	11	4	5	8	3	9	7	2	9	9	12	11	0	0	1	2	0
Oct ..	6.3	4.4	21	NW.	N.	19	8	4	1	5	2	6	12	5	7	10	14	14	0	1	0	1	0
Nov ..	7.7	4.7	24	S.	W.	4	9	4	4	7	7	12	7	6	3	9	18	19	1	7	0	0	0
Dec ..	6.0	5.2	34	NW.	NW.	4	3	4	8	13	2	12	14	2	6	14	11	16	1	6	0	1	0
Year .	6.4	5.2	..	......	NW.	124	87	47	42	76	73	106	145	30	65	126	174	169	17	64	5	38	0

PORT ANGELES, WASH.

[H=14. T=20. h=2.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	6.6	3.8	24	SW.	S.	0	0	1	14	44	3	0	0	0	4	8	19	17	0	12	0	0	0
Feb ..	7.4	3.4	27	NE.	S.	0	1	16	5	20	2	4	0	8	0	16	12	9	0	3	0	0	0
Mar ..	6.8	2.0	24	W.	S.	0	0	13	0	17	3	8	0	21	6	5	20	15	0	1	0	0	0
Apr ..	5.4	2.8	30	W.	W.	0	0	0	0	15	0	19	0	26	3	18	9	10	0	0	0	0	0
May .	6.6	3.0	32	W.	W.	1	0	3	1	10	2	23	0	22	3	12	16	16	0	0	0	0	0
June .	5.4	5.2	(*)	W.	W.	0	0	3	1	13	6	28	0	9	12	9	9	6	0	0	0	0	0
July .	2.7	5.6	24	W.	W.	0	0	0	0	13	0	45	0	4	22	4	5	0	0	0	0	0	0
Aug ..	5.3	4.9	24	W.	W.	0	0	0	0	6	0	49	0	7	9	12	10	6	0	0	0	0	0
Sept .	5.2	3.7	24	W.	S.	0	0	0	0	28	0	19	0	13	9	11	10	6	0	0	0	0	0
Oct ..	7.9	2.6	22	W.	W.	0	0	5	0	14	0	27	0	16	5	1	25	18	0	0	0	0	0
Nov ..	7.2	3.2	17	W.	W.	0	2	0	0	10	1	40	0	7	5	7	18	12	0	7	0	0	0
Dec ..	8.6	2.9	20	E.	S.	0	1	1	0	35	0	18	0	7	2	5	24	19	0	26	0	0	0
Year .	6.3	3.6	..	......	W.	1	4	42	21	225	17	280	0	140	80	108	177	134	0	49	0	0	0

* Self register out of order.

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

PORT HURON, MICH.

[Lat., 43° N.; Long., 82° 26′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan	29.30	1.61	26.1	29.3	28.4	52	5	34.1	22.7	21	23	83	79	3.08	0.97
Feb	29.40	1.34	13.4	19.8	16.6	41	−13	23.8	9.4	8	13	80	75	1.71	0.64
Mar	29.30	.85	31.2	34.7	34.2	63	14	40.9	27.4	24	26	76	72	0.73	0.62
Apr	29.34	1.09	41.0	43.6	43.0	74	24	50.9	35.2	32	33	71	69	1.88	0.85
May	29.28	.59	52.1	54.9	54.1	88	30	62.7	45.5	42	43	72	67	3.66	2.09
June	29.32	.78	58.2	59.7	60.2	84	42	68.4	51.9	53	54	82	81	1.86	0.33
July	29.32	.59	67.4	69.1	68.2	91	45	77.4	59.0	60	60	77	74	0.69	0.26
Aug	29.41	.56	64.4	68.3	67.4	89	46	77.5	57.2	56	55	76	65	0.14	0.08
Sept	29.36	.86	58.2	61.2	61.0	87	32	70.4	51.6	52	51	80	71	0.46	0.15
Oct	29.42	.98	41.8	45.2	44.6	68	26	51.5	37.6	35	36	78	71	1.56	0.59
Nov	29.35	1.26	36.2	38.8	38.6	60	13	43.6	33.5	32	32	85	78	3.73	0.92
Dec	29.39	1.09	34.1	37.0	36.6	62	12	42.4	30.7	28	30	81	78	2.72	0.69
Year	29.35	.97	43.7	46.8	46.1	91	−13	53.6	38.5	37	38	78	73	22.22	.....

PORTLAND, ME.

[Lat., 43° 39′ N.; Long., 70° 15′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan	29.87	1.52	26.7	30.2	29.1	52	6	35.7	22.5	20	22	76	73	3.47	1.04
Feb	29.93	1.59	17.5	22.3	20.3	42	− 8	27.8	12.8	10	13	74	70	2.74	1.50
Mar	29.74	1.70	32.2	35.7	34.6	60	16	41.1	28.2	22	27	69	73	2.68	0.89
Apr	29.86	1.03	43.5	43.7	44.4	66	26	51.6	37.3	33	35	69	76	2.39	1.24
May	29.84	.81	55.2	54.5	55.2	92	37	62.9	47.5	46	48	72	81	2.65	1.43
June	29.87	.93	63.9	63.3	64.0	84	46	71.6	56.3	57	57	80	82	3.26	1.35
July	29.86	.65	65.6	65.6	66.4	80	52	73.1	59.6	58	60	80	85	3.10	1.39
Aug	29.94	.62	63.8	63.1	64.6	81	47	72.2	57.0	58	58	81	86	2.76	1.06
Sept	29.94	.95	58.3	58.8	59.7	76	40	65.8	53.6	53	56	85	90	2.49	1.57
Oct	29.92	.93	43.7	45.8	46.2	68	26	52.8	39.5	38	40	81	80	3.47	1.27
Nov	29.92	1.30	38.1	40.5	40.9	60	20	46.9	34.9	32	33	79	78	7.95	3.40
Dec	29.96	1.83	29.8	32.4	32.0	60	4	39.0	25.1	22	25	75	76	4.96	2.22
Year	29.89	1.16	44.9	46.3	46.4	92	− 8	53.4	39.5	37	40	77	79	41.92	.....

PORTLAND, OREGON.

[Lat., 45° 32′ N.; Long., 122° 43′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan	30.04	.83	35.7	41.4	38.4	55	24	44.7	32.2	32	35	88	79	4.78	1.80
Feb	30.10	.78	38.5	49.8	44.2	64	23	53.4	35.1	35	39	90	66	1.07	0.46
Mar	29.84	1.25	47.1	60.7	53.8	78	35	63.9	43.7	43	44	86	58	1.80	0.63
Apr	29.94	.76	46.1	62.7	54.3	77	33	65.2	43.4	43	44	90	55	2.72	0.79
May	29.86	.90	51.6	67.4	60.3	88	42	70.9	49.7	49	50	91	58	4.02	1.00
June	29.92	.59	54.7	77.0	66.0	94	43	79.4	52.5	51	51	87	44	0.51	0.27
July	29.90	.56	58.0	82.8	70.4	96	46	84.4	56.4	55	53	90	38	T.	T.
Aug	29.92	.58	54.6	74.2	64.8	87	46	77.1	52.4	53	55	93	53	0.90	0.43
Sept	29.98	.65	51.8	70.8	61.4	89	38	73.4	49.3	49	53	91	57	1.61	0.75
Oct	29.86	.98	50.7	61.7	57.2	80	38	65.6	48.7	49	53	95	74	4.59	1.49
Nov	30.00	.99	43.6	50.3	47.6	64	32	54.1	41.2	41	43	92	78	3.97	0.90
Dec	29.81	1.22	36.0	39.8	38.6	53	25	43.0	34.1	34	35	95	84	5.79	1.04
Year	29.93	.84	47.4	61.6	54.8	96	23	64.6	44.9	44	46	91	62	31.76	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

PORT HURON, MICH.

[$H=639$. $T=70$. $h=66$.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan	7.1	12.8	54	SW.	SW.	3	6	7	5	12	15	9	5	0	6	5	20	14	12	29	0	0	0
Feb	7.1	11.9	35	NW.	W.	3	0	3	5	11	10	13	10	1	6	6	16	12	21	28	0	0	0
Mar	6.0	10.7	30	N.	N.	20	5	1	9	6	5	6	10	0	11	6	14	4	5	24	0	0	0
Apr	5.6	10.6	36	W.†	N.	14	11	3	5	13	4	3	7	0	10	5	15	10	0	10	0	0	1
May	6.2	12.1	48	NE.	S.	13	10	2	4	17	5	6	5	0	7	10	14	10	0	1	0	3	0
June	6.3	7.8	32	W.	S.	10	9	0	9	16	10	5	1	0	7	8	15	15	0	0	0	1	0
July	4.7	8.7	48	NW.	NE.	11	13	4	3	12	10	2	7	0	13	9	9	6	0	0	2	4	0
Aug	4.2	9.7	36	SW.	S.	6	9	2	6	13	12	8	4	2	13	14	4	3	0	0	0	0	0
Sept	4.8	10.8	37	SW.	S.	2	8	3	10	15	6	11	4	1	9	12	9	7	0	1	0	1	0
Oct	7.3	12.1	42	N.	NW.	7	11	9	5	7	6	3	14	0	4	7	20	8	0	6	0	1	0
Nov	7.2	11.2	40	SW.	SW.	4	7	7	3	9	12	11	7	0	7	4	19	16	3	12	0	0	0
Dec	6.3	13.2	67	SW.	S.	2	3	5	9	17	11	10	5	0	8	8	15	14	3	17	0	0	0
Year	6.1	11.0	...	.....	S.	75	92	46	73	148	106	87	79	4	101	94	170	119	44	128	2	10	1

PORTLAND, ME.

[$H=99$. $T=81$. $h=71$.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	5.1	8.8	47	SE.	NW.	11	3	2	4	5	9	11	17	0	5	10	16	11	10	24	0	0	0
Feb	5.0	8.7	33	S.	N.	18	2	1	2	5	7	14	6	1	7	7	14	12	16	28	0	0	0
Mar	5.8	9.1	32	NE.	N.	21	5	1	0	12	2	11	8	2	7	9	15	11	0	23	0	0	0
Apr	5.0	8.7	36	S.	S.	10	7	2	7	15	3	6	9	1	6	6	18	11	0	8	0	1	0
May	4.3	7.4	25	W.	S.	4	4	11	5	15	11	6	5	1	3	14	14	9	0	0	1	0	0
June	5.4	7.6	30	S.	S.	1	3	4	5	22	10	8	6	1	7	7	16	12	0	0	0	2	0
July	6.8	7.5	33	S.	S.	4	4	6	4	19	7	6	9	3	7	9	15	13	0	0	0	3	0
Aug	5.8	5.9	28	E.	S.	2	4	0	1	18	9	11	10	7	10	11	10	9	0	0	0	1	0
Sept	6.3	7.3	31	SW.	S.	6	7	5	3	13	5	7	6	8	7	9	14	6	0	0	0	0	0
Oct	5.8	8.3	36	S.	N.	19	4	2	2	7	11	6	9	2	8	10	13	10	0	2	0	0	0
Nov	5.9	7.7	38†	NE.	W.	6	4	0	1	7	14	14	10	4	9	6	15	11	0	10	0	0	1
Dec	5.1	8.3	40	S.	NW.	11	4	1	0	6	11	14	14	1	9	11	11	13	5	20	0	0	0
Year	5.3	7.9	...	.....	S.	113	51	35	31	144	99	114	109	31	85	109	171	128	31	115	1	7	1

PORTLAND, OREGON.

[$H=80$. $T=85$. $h=77$.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	5.9	5.1	30	S.	S.	8	5	10	5	18	1	1	14	0	7	4	20	16	0	14	0	0	0
Feb	5.3	4.1	22	SW.	NW.	9	5	1	8	9	2	1	20	1	6	12	10	10	0	6	0	0	0
Mar	5.9	5.4	28	SW.	NW.	1	2	3	8	20	1	2	24	1	8	12	11	13	0	0	0	0	0
Apr	6.5	5.6	30	S.	NW.	5	1	0	5	17	8	2	21	1	9	8	13	13	0	0	0	1	0
May	6.9	5.9	28	W.†	S.	3	1	1	6	23	3	2	22	1	10	8	13	14	0	0	0	3	0
June	3.6	7.0	26	SW.	NW.	4	0	0	5	11	3	0	37	0	18	5	7	4	0	0	3	0	0
July	2.1	5.8	20	NW.	NW.	3	1	0	1	1	1	0	55	0	25	4	2	0	0	0	6	0	0
Aug	3.0	5.6	26	NW.	NW.	5	1	0	2	8	0	0	45	1	19	9	3	4	0	0	0	0	0
Sept	3.9	5.7	25	S.	NW.	0	2	1	1	14	1	0	35	6	17	6	7	8	0	0	0	0	0
Oct	6.3	4.2	25	S.	NW.	1	1	4	3	20	1	1	30	1	8	8	15	19	0	0	0	0	0
Nov	6.1	4.7	33	S.	S.	4	3	1	2	27	0	5	17	1	10	3	17	14	0	0	0	0	0
Dec	6.6	5.0	28	S.	S.	2	2	5	8	23	0	2	18	2	7	5	19	21	0	13	0	0	0
Year	5.2	5.3	...	.....	NW.	45	24	26	54	191	21	16	338	15	144	84	137	136	0	33	9	4	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

PUEBLO, COLO.

[Lat., 38° 18′ N.; Long., 104° 36′ W.]

Month and year.	Pressure.		Temperature.							Dew-point.		Relative humidity.		Precipitation.	
	Mean.	Range.	8 a. m.	8 p. m.	Mean (max. and min.).	Maximum.	Minimum.	Mean. Maximum.	Mean. Minimum.	8 a. m.	8 p. m.	8 a. m.	8 p. m.	Total.	Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	25.22	.80	14.5	28.8	24.8	57	—11	39.2	10.4	8	11	76	52	.34	.23
Feb ..	25.24	.95	20.2	37.5	31.2	65	— 8	46.1	16.2	11	13	68	40	.24	.11
Mar ..	25.24	.85	32.1	53.4	44.2	73	18	59.5	29.0	19	16	59	27	.51	.44
Apr ..	25.23	.78	43.5	62.1	53.8	84	32	66.8	40.8	32	26	66	34	1.57	.58
May .	25.19	.90	50.7	67.5	59.8	87	33	72.8	46.7	34	30	60	30	1.40	.57
June .	25.26	.57	59.4	75.9	68.7	97	40	83.8	53.6	42	35	54	28	.84	.43
July .	25.28	.50	64.7	84.0	75.9	102	52	91.1	60.7	46	40	53	27	.81	.44
Aug ..	25.30	.49	63.7	80.9	75.8	99	52	90.6	61.1	48	46	60	34	1.60	1.04
Sept .	25.28	.72	50.5	71.0	62.6	97	31	77.7	47.5	32	30	53	37	.69	.39
Oct ..	25.32	.71	43.1	60.1	53.2	87	29	66.5	39.8	30	26	63	35	1.62	.80
Nov ..	25.34	.76	26.9	34.1	33.0	61	1	43.2	22.9	22	27	83	78	.72	.43
Dec ..	25.20	.91	33.0	46.2	42.8	68	6	56.1	28.3	27	34	80	66	.16	.16
Year .	25.26	.74	41.9	58.5	52.2	102	—11	66.1	38.1	29	28	65	41	10.50	....

RALEIGH, N. C.

[Lat., 35° 47′ N.; Long., 78° 38′ W.]

Jan ..	29.68	1.12	38.9	45.5	44.2	68	21	52.5	35.8	34	37	82	72	6.02	1.75
Feb ..	29.78	1.15	34.2	39.5	38.2	68	13	45.9	30.5	27	30	76	71	3.36	1.44
Mar ..	29.56	1.00	42.5	49.2	47.2	74	27	56.5	38.0	36	39	78	71	2.72	0.76
Apr ..	29.56	.98	52.5	59.9	58.3	89	32	68.9	47.7	47	48	75	68	4.01	1.19
May .	29.58	.56	66.0	70.3	68.2	94	40	80.0	56.5	56	58	71	67	5.30	2.79
June .	29.68	.58	71.0	74.2	73.6	93	49	83.1	64.1	63	66	78	75	10.44	5.18
July .	29.63	.43	75.0	75.8	77.5	95	62	85.8	69.2	68	68	79	77	6.04	0.99
Aug ..	29.72	.40	70.5	73.2	73.4	90	56	81.5	65.2	66	66	86	80	8.74	2.15
Sept .	29.66	.67	64.3	68.1	68.7	87	42	77.5	59.9	60	60	85	75	1.68	0.66
Oct ..	29.66	.72	52.4	57.5	57.6	82	34	67.7	47.5	4[illegible]	48	80	72	3.41	1.38
Nov ..	29.72	1.06	47.2	53.1	52.7	80	24	61.4	44.0	42	44	82	71	3.07	1.10
Dec ..	29.82	.76	46.4	54.0	53.4	75	25	63.2	43.5	40	42	80	66	0.60	0.55
Year .	29.67	.79	55.1	60.0	59.4	95	13	68.7	50.2	49	50	79	72	55.39	....

RAPID CITY, S. DAK.

[Lat., 44° 4′ N.; Long., 103° 12′ W.]

Jan ..	26.60	.83	19.8	23.1	22.8	57	— 3	33.2	12.5	12	16	75	75	.52	.18
Feb ..	26.64	1.00	17.5	22.9	21.0	58	—17	31.2	10.7	12	15	80	72	1.39	.86
Mar ..	26.64	.85	31.4	44.1	39.8	69	10	51.8	27.7	24	26	73	54	.56	.27
Apr ..	26.62	.75	42.7	54.9	49.8	80	21	60.7	38.8	31	30	66	43	4.22	2.02
May .	26.56	1.10	46.1	58.4	52.2	82	31	62.8	41.5	33	33	63	44	2.19	.43
June .	26.59	.58	57.7	71.0	64.6	95	43	76.7	52.6	44	45	61	43	2.97	.84
July .	26.60	.59	62.3	75.1	69.3	100	46	80.8	57.8	50	53	69	50	4.52	1.39
Aug ..	26.62	.54	61.9	79.3	72.0	100	49	85.5	58.4	48	52	62	40	.11	.06
Sept .	26.62	.72	49.6	61.9	58.2	94	30	70.9	45.4	35	38	60	44	.37	.30
Oct ..	26.70	.66	42.8	55.0	51.4	86	25	63.4	30.3	31	36	67	53	.43	.21
Nov ..	26.68	.83	27.8	32.9	32.8	72	0	44.6	21.1	16	18	64	56	.32	.25
Dec ..	26.52	.71	30.6	33.8	35.2	61	— 2	47.1	23.4	18	20	64	61	.33	.12
Year .	26.62	.76	40.8	51.0	47.4	100	—17	59.1	35.8	30	32	67	53	17.93	....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

PUEBLO, COLO.

[H=4,753. T=23. h=13.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan	3.4	5.5	48	N.	NW.	7	4	6	5	7	0	8	19	6	15	12	4	4	9	31	0	0	0
Feb	3.9	6.4	32	W.	E.	11	1	16	7	2	2	6	11	0	13	9	6	4	5	27	0	0	0
Mar	5.3	6.9	40	N.	NW.†	13	4	14	8	2	0	5	14	2	7	15	9	3	0	19	0	0	0
Apr	5.8	7.6	38	N.†	E.†	11	8	11	9	6	2	3	8	2	6	15	9	9	0	0	0	3	0
May	6.1	8.6	59	SW.	E.	10	3	13	7	5	8	7	6	3	4	21	6	9	0	0	0	1	0
June	4.6	6.8	36	NW.	E.	12	3	13	3	1	4	6	13	5	7	19	4	7	0	0	10	4	0
July	5.1	7.4	38	NW.	E.	10	3	16	3	2	3	9	13	3	4	21	6	6	0	0	22	3	0
Aug	4.8	6.8	48	NW.	NW.	11	4	7	5	4	1	11	15	4	4	26	1	8	0	0	21	13	0
Sept	3.4	6.1	36	NE.	E.	6	3	15	4	5	1	7	10	9	15	11	4	4	0	1	5	0	0
Oct	4.9	6.4	38	N.	NW.	9	7	13	4	0	2	4	18	5	12	10	9	5	0	4	0	0	0
Nov	5.1	5.9	48	N.	W.	9	1	6	2	1	1	22	14	4	7	16	7	5	7	27	0	0	0
Dec	4.1	7.3	38	W.	W.	5	4	9	4	2	4	17	15	2	10	19	2	1	1	23	0	0	0
Year	4.7	6.8	..	.....	NW.	114	45	139	61	37	28	105	156	45	104	194	67	65	22	132	58	24	0

RALEIGH, N. C.

[H=375. T=70. h=2.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	4.4	4.4	18	SW.†	NW.	7	13	1	1	6	11	2	14	7	14	9	8	13	0	10	0	0	0
Feb	5.6	4.6	20	SW.	NW.	11	6	1	0	1	10	4	18	5	8	8	12	8	1	16	0	1	0
Mar	4.6	6.8	30	N.	NW.	9	7	4	0	5	5	5	23	4	11	10	10	9	0	3	0	1	0
Apr	4.4	9.6	45	NW.	NW.	13	6	2	3	5	13	1	16	1	13	9	8	12	0	0	0	1	0
May	2.9	4.4	27	NW.	N.	18	2	4	5	2	5	3	13	10	22	4	5	12	0	0	4	3	0
June	6.4	4.1	17	NW.	S.	2	4	1	0	17	10	4	11	11	5	9	16	9	0	0	2	1	0
July	6.0	2.9	36	SE.	S.†	5	4	2	0	17	14	4	1	15	9	6	16	18	0	0	4	5	0
Aug	6.5	4.8	16	N.	S.†	14	7	4	1	15	14	3	2	2	6	11	14	19	0	0	0	1	0
Sept	5.7	5.6	25	NW.	N.†	19	2	3	1	14	4	3	11	3	8	13	9	7	0	0	0	1	0
Oct	4.4	6.4	30	N.	N.†	16	6	1	2	10	13	4	10	0	15	5	11	8	0	0	0	1	0
Nov	5.5	6.6	32	SW.	SW.†	11	6	1	0	7	18	7	8	2	11	8	11	11	0	2	0	0	0
Dec	5.4	5.9	23	SW.	SW.†	5	7	1	1	12	22	2	8	4	11	8	12	4	0	3	0	0	0
Year	5.2	5.5	..	.....	SW.	130	70	25	14	111	139	42	135	64	133	100	132	130	1	34	10	15	0

RAPID CITY, DAK.

[H=3,280. T=40. h=44.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	3.4	8.0	42	N.	NW.†	14	5	6	5	2	3	10	14	3	11	17	3	7	13	31	0	0	0
Feb	4.6	9.3	52	N.	N.	14	3	0	7	4	3	10	11	4	7	9	12	10	11	27	0	0	0
Mar	4.6	8.3	36	NW.	W.	14	2	5	7	5	1	15	10	3	8	11	12	5	3	19	0	0	0
Apr	5.4	10.1	48	NW.†	W.†	15	4	10	7	3	1	15	4	1	5	11	14	10	0	2	0	2	0
May	5.7	9.9	36	W.†	W.	13	8	6	8	2	4	18	3	0	2	13	16	13	0	1	0	3	0
June	4.4	9.1	36	N.	NW.	8	3	4	8	10	4	9	14	0	8	10	12	10	0	0	3	12	0
July	5.8	8.8	60	N.	W.	11	7	9	6	6	7	13	2	1	6	16	9	15	0	0	5	16	0
Aug	5.0	8.1	36	N.	S.	7	6	3	4	15	7	11	4	5	8	18	5	3	0	0	5	6	0
Sept	5.0	10.0	48	NW.	NW.	11	1	4	3	5	7	13	14	2	12	9	9	4	0	1	2	2	0
Oct	5.4	8.2	46	W.	NW.	12	2	2	8	5	6	12	12	3	8	15	8	6	0	4	0	1	0
Nov	3.7	8.1	36	NW.	NW.	10	8	0	0	1	5	6	25	5	15	13	2	6	7	27	0	0	0
Dec	4.9	7.3	47	SW.	NE.	9	13	4	1	6	4	8	11	6	12	11	8	7	2	27	0	0	0
Year	4.8	8.8	..	.....	W.	138	62	53	64	64	52	140	124	33	102	153	110	96	36	139	15	42	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

RED BLUFF, CAL.

[Lat., 40° 10′ N.; Long., 122° 15′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.)	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	29.76	.72	38.6	53.0	45.0	68	30	54.8	35.1	33	33	82	53	.51	.16
Feb ..	29.78	.79	42.3	60.9	50.8	80	26	63.2	38.5	36	34	80	42	.71	.45
Mar ..	29.60	.94	49.6	64.0	56.8	82	42	66.5	47.2	44	44	82	56	6.83	1.95
Apr ..	29.64	.48	52.7	69.2	61.2	87	40	71.7	50.6	46	46	81	48	1.11	.31
May .	29.57	.63	56.7	77.0	67.0	103	42	79.3	54.6	48	44	74	37	2.04	.85
June .	29.49	.40	66.2	93.9	79.7	105	55	95.2	64.2	52	44	62	20	.64	.58
July .	29.50	.49	67.2	96.7	81.2	111	54	97.6	64.9	47	40	52	15	.00	.00
Aug ..	29.49	.41	66.2	95.8	79.9	106	57	96.5	63.3	43	38	45	14	.00	.00
Sept ..	29.57	.45	64.7	88.8	76.0	105	52	90.4	61.5	36	38	39	19	.00	.00
Oct ..	29.64	.76	55.5	67.6	61.4	92	44	70.4	52.4	48	48	79	57	8.41	1.79
Nov ..	29.76	.65	49.0	60.0	54.4	76	36	63.9	44.8	40	42	74	58	3.37	1.70
Dec ..	29.64	.65	42.8	47.7	44.8	57	31	49.9	39.8	40	42	92	82	9.25	1.83
Year .	29.62	.61	54.3	72.9	63.2	111	26	75.0	51.4	43	41	70	42	32.87	.....

RIO GRANDE CITY, TEX.

[Lat., 26° 33′ N.; Long., 98° 48′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.)	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.91	.83	48.9	60.2	56.9	88	30	66.3	47.5	47	48	92	67	1.40	.53
Feb ..	29.94	.76	55.9	63.7	61.5	92	40	68.2	54.8	54	58	92	84	2.67	1.99
Mar ..	29.84	.60	55.9	68.5	61.5	84	44	74.1	54.9	55	56	96	66	2.16	.72
Apr ..	29.77	.55	67.7	78.1	76.0	96	54	86.3	65.8	66	63	93	64	4.38	3.70
May .	29.78	.56	71.1	79.9	78.2	96	59	87.3	69.1	68	69	90	70	.16	.06
June .	29.72	.40	76.5	86.6	84.6	104	66	94.9	74.3	74	72	92	64	3.03	1.47
July .	29.75	.34	78.3	91.4	87.8	104	75	98.8	76.8	75	70	90	52	.62	.28
Aug ..	29.78	.22	75.8	87.2	86.4	106	69	98.6	74.2	73	72	92	63	3.41	.88
Sept .	29.76	.57	69.2	80.1	78.4	98	54	89.3	67.5	68	69	97	72	2.25	1.20
Oct ..	29.85	.57	64.8	79.4	75.5	94	46	87.7	63.3	64	65	98	63	1.52	.95
Nov ..	29.94	.79	52.3	66.3	62.8	89	33	75.8	49.7	51	53	96	64	.85	.24
Dec ..	29.92	.61	61.5	74.0	71.2	88	46	82.0	60.4	61	63	99	69	.19	.17
Year .	29.83	.57	64.8	76.3	73.6	106	30	81.1	63.4	63	63	94	66	22.64	.....

ROCHESTER, N. Y.

[Lat., 43° 8′ N.; Long., 77° 42′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.)	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.32	1.44	27.8	30.8	29.5	49	4	34.9	24.1	23	25	82	80	3.33	0.96
Feb ..	29.40	1.35	16.6	19.6	17.7	45	−9	24.7	10.7	12	15	83	84	2.41	0.40
Mar ..	29.28	1.15	31.6	34.0	34.0	61	17	40.4	27.6	24	26	75	76	1.78	0.68
Apr ..	29.33	1.21	43.4	45.6	45.9	85	28	53.9	37.9	33	33	70	63	2.84	1.18
May .	29.28	.62	56.1	59.1	57.6	92	31	66.1	49.0	46	48	68	69	2.36	1.92
June .	29.33	.86	62.1	64.2	63.4	81	44	71.3	55.4	54	56	77	76	5.36	1.49
July .	29.32	.64	68.9	72.4	70.2	88	52	78.5	62.0	61	60	76	67	3.08	0.92
Aug ..	29.42	.58	64.3	68.3	66.3	85	49	76.0	56.6	55	57	72	67	1.12	0.63
Sept .	29.38	.95	59.7	63.1	62.2	88	39	70.1	54.3	52	55	77	75	2.21	0.78
Oct ..	29.40	.97	41.4	45.0	43.9	67	23	50.1	37.7	35	38	79	77	4.02	1.82
Nov ..	29.36	1.27	38.7	41.4	40.3	63	20	45.0	35.6	32	34	79	76	4.62	1.37
Dec ..	29.40	1.50	35.8	37.4	36.6	61	14	42.7	30.6	28	31	76	78	2.57	0.48
Year .	29.35	1.04	45.5	48.4	47.3	92	−9	54.5	40.1	38	40	76	74	35.70	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

RED BLUFF, CAL.

[H=342. T=54. h=44.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	2.6	6.0	30	N.	N.	26	0	1	1	9	1	7	9	8	17	5	9	7	0	5	0	0	0
Feb ..	2.6	5.5	40	N.	S.	15	0	0	2	17	0	1	15	6	11	14	3	4	0	8	0	0	0
Mar ..	5.8	8.6	36	S.	S.	9	0	0	1	34	2	0	13	3	9	9	13	15	0	0	0	2	0
Apr ..	4.8	6.6	30	S.	S.	9	0	0	0	34	0	4	9	4	10	12	8	9	0	0	0	1	0
May .	3.7	8.2	40	S.	NW.	9	0	2	15	12	1	6	16	1	20	1	10	10	0	0	10	2	0
June .	1.3	6.1	26	NW.	SE.	2	0	2	23	8	1	3	17	4	27	2	1	2	0	0	24	0	0
July .	1.3	5.4	34	NW.	SE.	3	0	2	18	18	3	2	11	5	30	1	0	0	0	0	29	0	0
Aug ..	1.2	4.6	26	NW.	SE.	6	0	1	19	12	6	6	10	2	30	1	0	0	0	0	27	0	0
Sept .	0.8	7.4	36	NW.	NW.	6	1	0	14	5	1	2	26	5	28	2	0	0	0	0	15	0	0
Oct ..	6.0	7.0	39	SE.	SE.	3	2	1	17	15	2	1	17	4	8	9	14	16	0	0	3	0	0
Nov ..	4.8	7.5	44	SE.	NW.	7	1	0	10	9	1	2	22	8	12	8	10	8	0	0	0	0	0
Dec ..	8.0	8.9	44	SE.	SE.	2	0	1	27	8	0	0	21	3	3	6	22	25	0	2	0	0	0
Year .	3.6	6.8	..	.....	NW.	97	4	10	147	181	18	34	186	53	205	70	90	96	0	10	108	5	0

RIO GRANDE CITY, TEX.

[H=230. T=12. h=2.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	5.0	5.5	24	N.	N.	17	7	14	11	1	0	0	5	7	6	9	16	6	0	1	0	0	0
Feb ..	8.6	4.8	20	NE.	E.	9	11	15	13	4	2	0	0	2	3	0	25	7	0	0	1	0	0
Mar ..	5.0	6.1	24	S.	N.	19	11	8	7	10	0	0	0	7	11	9	11	8	0	0	0	0	0
Apr ..	5.6	6.4	30	NE.	S.	4	4	6	15	24	3	0	0	4	10	9	11	5	0	0	7	2	0
May .	6.6	7.2	24	S.	S.	1	3	4	15	34	2	0	1	2	4	13	14	5	0	0	9	1	0
June .	6.6	6.5	24	NE.	S.	0	2	4	16	35	0	0	0	3	3	15	12	6	0	0	24	4	0
July .	3.1	7.9	20	S.	S.	0	0	1	9	49	0	0	0	3	17	5	9	4	0	0	31	0	0
Aug ..	8.4	6.6	30	SE.	E.	0	2	27	22	7	0	0	0	4	3	1	27	7	0	0	26	1	0
Sept .	6.5	8.0	25	SE.	SE.	10	12	9	21	4	2	1	0	1	3	14	13	9	0	0	21	0	0
Oct ..	3.1	5.4	34	SE.	SE.	1	6	4	37	12	1	0	1	0	19	10	2	5	0	0	10	1	0
Nov ..	4.4	7.4	38	N.	SE.	12	13	6	21	4	2	0	1	1	12	11	7	8	0	0	0	0	0
Dec ..	4.7	7.8	30	N.	SE.	3	0	1	47	8	1	1	0	1	8	17	6	2	0	0	0	0	0
Year .	5.6	6.6	..	.....	SE.	76	71	99	234	192	13	2	8	35	99	113	153	72	0	1	129	9	0

ROCHESTER, N. Y.

[H=621. T=129. h=125.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	6.4	10.8	56	SW.	W.	0	4	6	8	3	15	22	2	2	4	8	19	21	13	25	0	0	0
Feb ..	6.6	8.2	37	W.	W.	2	0	2	6	9	5	28	2	2	4	6	18	23	19	27	0	0	0
Mar ..	5.9	7.0	30	W.	NW.	3	12	5	4	2	5	12	15	4	4	13	14	9	5	22	0	0	0
Apr ..	5.4	8.2	36	W.	W.	2	11	5	2	2	5	14	7	12	6	12	12	11	0	9	0	1	0
May .	6.6	10.7	42	W.	W.	4	8	3	6	1	13	23	3	1	4	15	12	13	0	1	1	0	0
June .	6.6	9.6	32	W.	SW.	4	7	2	6	6	15	14	6	0	2	19	9	17	0	0	0	2	0
July .	5.6	8.6	25	SW.	W.	7	3	1	8	5	11	15	11	1	8	14	9	15	0	0	0	5	0
Aug ..	5.2	8.1	29	SW.	SW.	1	2	5	3	4	22	13	10	2	9	14	8	11	0	0	0	1	0
Sept .	5.6	8.0	25	W.	SW.	2	7	4	7	3	21	8	5	3	9	9	12	12	0	0	0	1	0
Oct ..	7.0	8.9	28	NW.	W.	4	9	1	11	4	6	15	12	0	5	10	16	15	0	4	0	1	0
Nov ..	8.1	9.4	31	W.	W.	3	5	5	6	5	8	17	11	0	3	6	21	13	3	9	0	0	0
Dec ..	7.8	12.0	54	W.	NW.	2	6	2	9	9	8	11	14	1	3	9	19	23	5	13	0	1	0
Year .	6.4	9.1	..	.....	W.	34	74	41	76	53	134	192	98	28	61	135	169	183	45	110	1	12	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

ROSEBURGH, OREGON.

[Lat., 43° 13′ N.; Long., 123° 20′ W.]

Month and year.	Pressure.		Temperature.							Dew-point.		Relative humidity.		Precipitation.	
	Mean.	Range.	8 a. m.	8 p. m.	Mean (max. and min.).	Maximum.	Minimum.	Mean. Maximum.	Mean. Minimum.	8 a. m.	8 p. m.	8 a. m.	8 p. m.	Total.	Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	29.56	.75	36.8	45.6	42.0	59	22	50.9	33.0	35	39	95	79	2.96	1.01
Feb ..	29.62	.85	36.7	54.3	45.2	68	22	57.0	33.3	35	40	96	62	0.70	0.18
Mar ..	29.37	1.23	44.2	61.5	52.7	80	29	64.6	40.8	42	44	92	56	2.24	0.58
Apr ..	29.47	.68	46.1	63.1	54.4	76	34	65.6	43.3	44	45	92	54	1.57	0.33
May .	29.42	.90	48.9	67.0	58.5	87	40	70.6	46.4	46	49	91	54	2.67	0.83
June .	29.45	.43	52.2	78.7	65.0	95	43	80.4	49.5	47	47	84	35	0.14	0.08
July .	29.45	.50	54.9	85.6	70.4	97	42	87.8	53.0	50	50	85	30	.00	.00
Aug ..	29.48	.51	52.6	78.2	65.0	90	45	79.8	50.1	48	49	84	38	0.45	0.44
Sept .	29.53	.55	48.5	74.3	61.0	90	35	76.5	45.4	45	46	87	39	0.24	0.13
Oct ..	29.44	.98	48.2	61.6	54.6	82	35	64.2	45.1	47	50	94	69	5.28	1.24
Nov ..	29.58	.88	41.3	52.0	46.8	64	29	55.9	37.8	40	44	95	75	5.26	1.88
Dec ..	29.39	.91	38.0	43.6	40.0	57	24	45.4	34.5	35	37	91	80	6.61	1.13
Year .	29.48	.76	45.7	63.8	54.6	97	22	66.6	42.7	43	45	90	56	28.12	....

SACRAMENTO, CAL.

[Lat., 38° 35′ N.; Long., 121° 30′ W.]

Jan ..	30.02	.86	38.6	50.6	44.7	62	31	53.6	35.8	35	40	87	69	.15	.08
Feb ..	30.04	.76	42.2	58.4	50.2	76	31	61.0	39.3	39	40	87	54	.33	.20
Mar ..	29.88	.87	50.5	63.4	57.4	76	41	66.3	48.5	47	50	88	64	6.25	2.57
Apr ..	29.94	.49	52.3	68.6	61.2	84	42	71.3	51.2	48	48	86	50	.26	.14
May .	29.86	.56	53.5	73.0	64.2	94	44	76.0	52.3	49	54	86	53	3.25	1.94
June .	29.78	.34	56.3	80.5	70.1	96	52	84.7	55.5	53	59	87	49	.25	.25
July .	29.78	.45	56.8	85.4	72.8	104	50	89.4	56.2	51	59	82	42	.00	.00
Aug ..	29.77	.38	57.2	86.9	74.0	102	51	91.8	56.2	51	58	81	38	.00	.00
Sept .	29.84	.45	57.5	83.1	71.9	101	49	87.9	55.9	46	50	68	33	.00	.00
Oct ..	29.92	.70	53.8	66.8	61.7	94	42	71.6	51.8	50	52	86	63	6.02	1.86
Nov ..	30.03	.51	47.9	59.1	54.2	72	38	63.0	45.3	43	46	84	64	3.15	.96
Dec ..	29.93	.69	45.6	49.8	48.5	60	33	53.5	43.5	44	44	93	82	7.82	.98
Year .	29.90	.59	51.0	68.8	60.9	104	31	72.5	49.3	46	50	85	55	27.48	....

ST. LOUIS, MO.

[Lat., 38° 38′ N.; Long., 90° 12′ W.]

Jan ..	29.46	.97	30.6	36.8	34.8	64	13	42.3	27.4	25	27	81	70	3.04	1.31
Feb ..	29.57	1.28	26.1	33.9	31.4	69	0	40.3	22.5	21	25	80	72	4.78	1.85
Mar ..	29.42	.84	40.5	49.2	46.6	76	25	55.3	37.9	32	38	74	68	1.62	0.73
Apr ..	29.43	.85	51.3	61.6	57.9	84	30	67.4	48.4	41	42	68	51	1.68	0.84
May .	29.38	.53	59.0	66.6	63.8	90	42	73.2	54.4	50	51	72	60	3.80	0.94
June .	29.42	.70	66.0	73.1	70.6	93	47	79.2	62.1	59	61	79	67	4.72	1.13
July .	29.40	.42	73.6	80.4	77.8	93	61	86.1	69.6	66	65	77	61	2.02	0.45
Aug ..	29.50	.35	69.2	78.4	75.4	91	60	84.8	66.0	60	61	74	56	.85	0.64
Sept .	29.46	.66	61.4	68.4	67.0	90	42	75.5	58.4	55	55	78	65	3.54	1.85
Oct ..	29.54	.76	49.0	58.0	55.1	84	35	63.5	46.7	41	41	75	56	1.65	1.05
Nov ..	29.52	1.07	37.8	43.2	41.4	62	14	47.5	35.3	32	34	81	72	4.43	1.50
Dec ..	29.51	.90	45.6	52.0	49.8	73	20	57.9	41.6	40	42	80	70	1.03	0.62
Year .	29.47	.78	50.8	58.5	56.0	93	0	64.4	47.5	44	45	77	64	33.16	....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

ROSEBURGH, OREGON.

[H=523. T=54. h=47.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	5.7	2.6	17	S.	E.	5	2	13	4	7	7	11	12	1	5	19	7	13	0	12	0	0	0
Feb ..	4.6	2.2	18	NW	E.	5	3	11	5	8	5	9	8	2	7	15	6	8	0	9	0	0	0
Mar ..	6.2	3.2	24	S.†	NW.	6	2	8	2	11	3	9	14	7	4	17	10	15	0	1	0	1	0
Apr ..	6.1	3.8	25	S.	NW.	6	2	11	2	5	8	4	21	1	4	17	9	9	0	0	0	0	0
May .	5.6	4.1	24	W.	NW.	10	3	11	4	8	5	6	14	1	9	12	10	17	0	0	0	0	0
June .	3.4	4.7	24	NE.	N.	19	10	7	1	0	4	2	9	8	21	5	4	4	0	0	4	0	0
July .	2.0	4.8	24	N.	NW.	15	15	1	0	2	1	3	17	8	24	7	0	0	0	0	12	0	0
Aug ..	1.8	3.7	22	NW.	N.	15	12	2	1	1	0	2	11	18	23	5	3	2	0	0	1	0	0
Sept .	2.1	3.8	23	S.	E.	9	11	14	2	4	2	2	6	10	22	3	5	4	0	0	0	0	0
Oct ..	6.8	2.4	20	S.	NW.	5	7	5	0	9	4	6	11	15	3	10	18	17	0	0	0	0	0
Nov ..	5.7	2.2	27	SE.	NE.	3	12	10	3	3	3	4	7	15	9	9	12	13	0	5	0	1	0
Dec ..	8.5	2.6	35	SE.	S.	4	2	13	5	15	10	1	3	9	3	2	26	19	0	10	0	0	0
Year .	4.9	3.3	..	......	NW.	102	81	106	29	73	52	59	133	95	134	121	110	121	0	37	17	2	0

SACRAMENTO, CAL.

[H=64. T=61. h=57.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	2.6	5.0	27	NW.	NW.	15	1	2	14	5	2	4	16	3	18	9	4	3	0	5	0	0	0
Feb ..	2.2	5.0	36	NW.	SE.	9	3	1	23	2	5	0	9	4	13	12	3	4	0	2	0	0	0
Mar ..	4.4	7.1	30	NW.	SE.	9	0	2	23	6	12	0	8	2	6	12	13	14	0	0	0	2	0
Apr ..	4.8	6.6	24	SW.	SW.	2	0	0	18	9	22	0	8	1	8	15	7	6	0	0	0	0	0
May .	2.7	7.6	36	S.	SW.	4	1	2	14	13	18	0	7	3	20	8	3	8	0	0	4	1	0
June .	0.6	7.7	25	SW.	SW.	0	0	0	17	18	21	0	3	1	29	0	1	1	0	0	5	0	0
July .	0.2	7.1	20	SW.	S.	1	0	0	13	26	18	0	3	1	31	0	0	0	0	0	13	0	0
Aug ..	0.1	6.3	21	NW.	SE.	1	0	0	24	17	17	0	3	0	31	0	0	0	0	0	18	0	0
Sept .	0.1	6.2	36	NW.	S.	4	3	2	10	16	10	0	11	4	30	0	0	0	0	0	9	0	0
Oct ..	4.8	6.7	30	S.	SE.	4	2	2	14	10	6	0	13	11	12	12	7	11	0	0	2	0	0
Nov ..	3.8	6.4	30	NW.	SE.	13	4	5	13	6	3	0	10	6	17	5	8	7	0	0	0	1	0
Dec ..	6.8	8.7	42	SE.	SE.	3	2	1	23	17	4	1	10	1	2	18	11	23	0	0	0	0	0
Year .	2.8	6.7	..	......	SE.	65	16	17	206	145	138	5	101	37	217	91	57	77	0	7	51	4	0

ST. LOUIS, MO.

[H=571. T=107. h=09.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	5.0	12.4	48	NW.†	W.	7	4	2	4	10	8	14	10	3	9	12	10	8	4	21	0	0	0
Feb ..	4.3	11.5	48	SW.	NW.	5	5	7	5	5	4	7	17	1	10	9	9	9	7	21	0	1	0
Mar ..	4.0	11.0	36	NE.	NE.	4	17	7	5	1	4	10	14	0	9	17	5	4	0	5	0	0	0
Apr ..	3.2	11.2	42	NW.	SE.†	11	9	2	11	10	3	6	8	0	16	10	4	6	0	1	0	0	0
May .	4.5	11.8	38	N.†	S.	7	5	3	5	17	5	9	8	3	10	11	10	11	0	0	0	1	0
June .	4.2	7.5	44	W.	SE.	6	3	4	11	10	8	11	3	4	11	13	6	10	0	0	3	9	0
July .	5.1	6.8	34	W.	SW.	5	7	2	10	8	14	5	4	7	11	15	5	12	0	0	9	2	0
Aug ..	3.3	6.4	30	SW.	SW.	2	5	4	15	1	15	1	3	16	18	10	3	3	0	0	2	2	0
Sept .	5.4	9.3	36	W.	SW.	4	5	2	11	3	22	4	7	2	10	9	11	10	0	0	1	2	0
Oct ..	4.6	9.4	36	SE.	NE.	8	15	6	6	0	8	3	15	1	13	6	12	5	0	0	0	0	0
Nov ..	6.3	10.5	36	NW.	NW.	7	9	1	5	4	8	6	17	3	10	5	15	11	2	7	0	0	0
Dec ..	5.0	10.2	39	W.	SW.	3	5	0	11	4	23	7	7	1	11	12	8	6	1	2	0	0	0
Year .	4.6	9.8	..	......	SW.	69	89	40	99	73	122	83	113	41	138	129	98	95	14	57	15	17	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

ST. PAUL, MINN.

[Lat., 44° 58′ N.; Long., 93° 3′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	29.08	1.40	14.3	21.9	20.2	42	—10	28.0	12.5	11	17	88	82	.55	.27
Feb ..	29.20	1.70	4.8	13.8	10.2	50	—25	19.9	0.4	2	9	89	83	.31	.07
Mar ..	29.12	.71	29.2	39.6	36.6	67	13	46.1	27.1	24	31	80	71	.99	.41
Apr ..	29.10	.97	40.4	53.6	48.5	76	26	59.2	37.8	32	40	74	61	1.14	.52
May .	29.03	.94	49.8	61.1	56.0	84	33	66.2	45.9	40	44	71	55	2.86	1.26
June .	29.06	.69	59.1	68.8	64.3	90	42	74.1	54.5	52	52	77	57	1.61	.63
July .	29.04	.59	65.4	75.1	71.2	96	50	81.3	61.1	59	59	79	59	3.08	2.10
Aug ..	29.10	.55	63.1	74.9	70.5	91	49	81.0	60.0	57	58	81	56	3.56	1.90
Sept .	29.04	.71	51.8	62.3	59.2	88	32	70.1	48.3	45	47	79	60	0.51	.21
Oct ..	29.25	.75	36.0	48.3	45.1	76	25	55.5	34.7	29	33	76	56	.06	.06
Nov ..	29.18	.93	23.7	30.7	29.5	56	— 4	37.6	21.4	18	23	80	74	.97	.53
Dec ..	29.09	1.14	25.1	30.2	28.6	47	— 4	34.8	22.3	20	25	83	81	1.32	.66
Year .	29.11	.92	38.6	48.4	45.0	96	—25	54.5	35.5	32	36	80	66	16.96	.....

ST. VINCENT, MINN.

[Lat., 45° 56′ N.; Long., 97° 14′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.14	1.17	3.3	8.7	6.7	48	—36	15.4	— 2.0	0	5	88	84	.82	.50
Feb ..	29.24	1.32	7.6	1.2	—3.0	38	—43	7.1	—13.1	—12	3	85	81	1.03	.56
Mar ..	29.20	.66	23.0	33.6	30.4	69	— 9	40.9	19.8	18	27	82	76	.35	.32
Apr .	29.14	1.14	35.6	48.8	42.8	83	9	55.9	29.7	29	33	77	58	.69	.30
May .	29.06	1.48	15.4	59.1	50.4	80	22	64.4	36.3	37	37	73	49	.81	.52
June .	29.04	.67	58.5	73.0	62.8	92	33	77.2	48.3	47	45	68	39	.76	.32
July .	29.03	.60	61.2	71.3	65.0	94	41	77.4	52.7	55	57	81	62	1.23	.36
Aug ..	29.06	.76	58.0	71.9	65.5	95	32	78.5	52.5	53	57	83	61	2.20	.74
Sept .	29.02	.98	45.4	54.0	51.6	94	28	62.0	41.2	40	44	81	70	2.77	.82
Oct ..	29.28	.78	32.5	42.4	40.4	77	9	51.4	29.3	26	34	78	72	.18	.14
Nov ..	29.20	1.13	18.7	25.4	23.9	58	— 5	32.5	15.3	13	18	78	74	1.20	.49
Dec ..	29.12	.99	6.8	12.0	10.6	40	—21	20.5	0.6	1	5	76	74	2.40	.66
Year .	29.13	.97	31.7	41.8	37.3	95	—43	48.6	25.9	26	30	79	67	14.44	.....

SALT LAKE CITY, UTAH.

[Lat., 40° 46′ N.; Long., 111° 54′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	25.72	.95	17.1	25.0	21.4	44	5	29.9	12.9	10	17	75	73	.73	.26
Feb ..	25.74	.99	*24.7	33.2	29.8	51	8	37.7	21.8	18	23	76	68	.81	.51
Mar ..	25.64	.79	41.8	54.2	47.7	68	32	57.5	37.9	29	32	61	45	1.64	.60
Apr ..	25.60	.69	47.5	63.0	55.2	84	32	65.8	44.6	32	31	57	33	1.52	.40
May .	25.55	.73	52.7	67.0	58.8	87	34	69.5	48.1	35	33	55	33	2.97	1.16
June .	25.60	.46	62.2	79.8	70.3	97	47	83.3	57.3	35	34	38	21	.01	.01
July .	25.61	.48	69.7	88.7	78.4	102	52	91.9	65.0	35	35	30	17	.08	.04
Aug ..	25.64	.47	69.3	84.9	77.4	98	45	89.9	64.8	44	40	42	25	.92	.54
Sept .	25.70	.55	53.1	69.1	60.6	81	35	73.0	48.1	29	30	41	27	.52	.26
Oct ..	25.70	.45	49.2	58.1	54.2	86	30	64.2	44.2	33	36	58	49	3.85	.98
Nov ..	25.78	.68	34.8	42.5	39.0	61	26	47.5	30.5	25	28	68	57	1.04	.28
Dec ..	25.58	.63	39.0	41.2	39.6	57	11	45.9	33.4	29	31	69	68	4.37	.82
Year .	25.66	.66	46.8	58.9	52.7	102	5	63.0	42.4	30	31	56	43	18.46	.....

* 1 a. m. observation missed.

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

ST. PAUL, MINN.

[$H=831$. $T=114$. $h=108$.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan	5.6	6.0	26	NW.	NW.	1	2	9	7	5	9	12	14	3	5	13	13	10	16	31	0	0	0
Feb	5.2	6.4	29	W.	W.	1	2	12	7	2	8	13	10	1	7	13	8	9	24	28	0	0	0
Mar	4.9	7.0	30	NW.	NW.	6	3	5	4	3	5	14	18	4	11	12	8	6	2	20	0	0	0
Apr	5.4	8.6	30	W.	NW.†	3	5	9	14	2	4	5	14	4	8	13	9	10	0	4	0	3	0
May	5.2	7.6	38	SE.	NW.	11	4	4	8	4	5	7	13	6	7	18	6	10	0	0	0	5	0
June	6.2	6.1	23	NW.	NW.	5	5	10	9	6	6	5	13	1	0	21	9	6	0	0	0	2	0
July	5.4	7.0	28	SE.	SE.	5	5	11	15	4	2	10	10	0	7	17	7	12	0	0	3	3	0
Aug	4.7	6.9	36	SW.	SE.	3	1	8	23	2	3	10	11	1	11	16	4	5	0	0	1	4	0
Sept	5.5	8.5	36	W.	SE.	0	0	9	14	5	7	13	12	0	8	13	9	10	0	0	0	0	0
Oct	4.5	6.4	24	W.	SE.	9	3	12	18	0	2	5	10	3	15	7	9	1	0	14	0	0	0
Nov	5.1	6.8	26	W.	SE.	6	0	10	13	4	3	12	12	0	13	5	12	10	7	28	0	0	0
Dec	6.2	7.6	28	N.	SE.	5	3	11	15	3	8	8	9	0	7	10	14	9	10	27	0	0	0
Year	5.3	7.1	..	.....	SE.	55	33	110	147	40	62	114	146	23	99	158	108	98	59	152	4	17	0

ST. VINCENT, MINN.

[$H=804$. $T=20$. $h=16$.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	4.8	9.1	38	NW.	NW.	2	2	1	5	18	4	7	20	3	9	7	15	10	27	31	0	0	2
Feb	4.2	10.5	38	N.	S.	7	2	1	1	21	5	3	15	1	13	6	9	8	26	28	0	0	4
Mar	3.1	10.4	38	NW.	NW.	13	3	2	8	11	3	5	17	0	15	10	6	4	9	28	0	0	6
Apr	3.6	12.4	44	S.	N.	19	2	7	6	11	4	3	8	0	13	10	7	5	0	15	0	0	3
May	4.7	10.1	44	S.	N.	16	6	6	4	9	8	3	8	2	11	9	11	6	0	11	0	3	1
June	3.6	9.3	38	S.	S.	15	2	2	4	19	5	4	9	0	16	8	6	6	0	0	1	6	1
July	5.1	8.8	40	W.	S.	11	2	1	2	24	3	5	12	2	9	14	8	12	0	0	2	9	1
Aug	3.5	7.9	36	S.	S.	10	1	5	9	17	0	6	9	5	20	7	4	7	0	0	1	3	2
Sept	5.8	10.8	50	S.	N.	13	4	2	4	11	7	6	12	1	11	5	14	10	0	6	1	3	2
Oct	4.2	9.5	36	NW.	N.	24	3	0	4	20	5	3	2	1	13	9	9	3	2	15	0	0	0
Nov	4.0	8.9	40	N.	N.	23	0	0	2	22	4	3	6	0	15	7	8	12	14	29	0	0	0
Dec	5.1	8.2	36	S.	N.	26	3	1	4	19	4	1	4	0	10	10	11	14	23	31	0	0	0
Year	4.3	9.7	..	.....	S.	179	30	28	53	202	52	49	122	15	155	102	108	97	101	194	5	24	22

SALT LAKE CITY, UTAH.

[$H=4,348$. $T=90$. $h=77$.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	3.2	3.0	18	SE.	SE.	0	1	1	31	3	2	2	12	10	19	7	5	5	21	30	0	0	0
Feb	4.5	3.3	19	NW.	NW.	0	1	0	20	3	2	2	22	5	12	7	9	8	8	23	0	0	0
Mar	4.2	5.6	34	SE.	NW.	1	2	3	18	3	1	2	29	3	17	9	5	7	0	0	0	0	0
Apr	4.8	6.6	36	NW.	NW.	2	1	3	15	6	1	4	26	2	14	10	6	11	0	0	0	1	0
May	5.7	6.6	36	S.	NW.	6	5	2	11	6	5	1	25	1	9	14	8	7	0	0	0	1	0
June	2.8	6.1	42	W.	SE.	10	4	1	21	0	1	2	20	1	23	7	0	1	0	0	5	0	0
July	1.6	6.5	34	SW.	NW.	4	3	1	19	6	2	0	25	2	25	6	0	2	0	0	21	0	0
Aug	4.5	5.8	36	S.	SE.	3	3	4	21	8	2	1	17	3	14	12	5	8	0	0	19	2	0
Sept	2.7	5.0	24	NW.	NW.	9	0	1	12	0	1	0	31	6	22	5	3	3	0	0	0	0	0
Oct	5.5	4.6	28	E.	NW.	4	3	3	18	3	2	0	22	7	12	7	12	13	0	1	0	0	0
Nov	4.6	4.0	30	NW.	NW.	6	2	3	13	3	1	1	18	13	13	9	8	6	0	21	0	0	0
Dec	7.7	6.1	30	E.	S.	0	3	7	11	24	3	1	4	9	2	9	20	23	2	12	0	0	0
Year	4.3	5.3	..	.....	NW.	45	28	29	210	65	23	16	251	62	182	102	81	94	31	87	45	4	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

SAN ANTONIO, TEX.

[Lat., 29° 27′ N.; Long., 98° 28′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	29.28	.74	44.5	53.6	51.6	80	28	60.3	42.8	38	42	80	67	5.11	1.12
Feb ..	29.34	.75	48.8	57.2	55.0	81	33	62.9	47.2	44	45	84	66	3.46	1.73
Mar ..	29.22	.69	51.5	62.9	59.4	84	40	68.8	50.0	46	46	83	56	3.74	2.22
Apr ..	29.19	.52	61.5	71.9	69.0	87	49	78.5	59.6	58	60	90	68	2.91	1.24
May .	29.20	.58	66.4	75.9	72.6	88	46	81.7	63.6	62	62	87	63	0.55	0.39
June .	29.16	.40	72.7	82.3	79.0	95	58	87.9	70.2	70	70	91	68	4.79	1.75
July .	29.19	.31	74.9	85.5	81.7	98	68	91.0	72.4	72	70	92	62	4.04	2.37
Aug ..	29.21	.21	73.0	83.9	80.7	95	67	90.8	70.6	70	67	90	58	3.19	1.96
Sept .	29.20	.57	67.1	74.6	73.6	92	52	82.1	65.1	64	6[illegible]	89	69	5.47	1.76
Oct ..	29.28	.54	59.6	72.4	69.4	91	42	80.8	58.1	56	56	88	58	0.97	0.78
Nov ..	29.34	.72	46.3	58.6	55.8	79	31	67.6	43.9	40	41	80	55	4.46	1.52
Dec ..	29.34	.59	60.1	65.9	66.0	82	35	74.0	58.1	57	55	90	66	0.27	0.12
Year .	29.25	.55	60.5	70.5	67.8	98	28	77.2	58.5	56	56	87	63	38.96	.....

SAN DIEGO, CAL.

[Lat., 32° 43′ N.; Long., 117° 10′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.92	.74	45.9	57.3	54.8	78	36	66.9	42.8	40	51	81	78	1.72	.69
Feb ..	29.96	.52	48.3	60.9	58.0	85	37	70.8	45.2	41	51	78	71	1.80	.95
Mar ..	29.91	.51	54.0	62.3	59.2	80	45	67.2	51.1	50	53	88	72	2.20	1.16
Apr ..	29.90	.40	55.6	64.5	60.4	83	47	67.8	53.1	52	54	89	70	0.19	.14
May .	29.88	.19	57.5	63.8	60.8	80	50	66.9	54.6	52	53	82	69	0.03	.02
June .	29.84	.21	61.4	66.5	64.0	72	56	69.2	58.7	57	57	85	72	0.10	.10
July .	29.80	.26	64.1	70.7	67.6	84	59	73.2	62.0	61	61	89	73	T.	T.
Aug ..	29.78	.26	67.3	73.7	70.8	89	62	76.7	64.8	64	64	89	71	0.04	.04
Sept .	29.82	.39	66.1	72.7	70.2	91	54	77.6	62.9	56	58	74	64	T.	T.
Oct ..	29.91	.30	60.1	67.5	65.4	80	52	72.0	58.8	56	57	87	72	2.12	1.54
Nov ..	29.96	.36	55.0	64.7	62.0	83	46	71.6	52.4	37	49	56	62	0.12	.08
Dec ..	29.96	.43	53.8	58.7	57.4	69	40	62.5	52.3	50	52	87	79	7.71	2.30
Year .	29.89	.38	57.4	65.3	62.6	91	36	70.2	54.9	51	55	82	71	16.03	.....

SANDUSKY, OHIO.

[Lat., 41° 25′ N.; Long., 82° 40′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.32	1.38	29.8	32.6	31.8	57	13	37.5	26.1	24	25	82	74	2.43	.82
Feb ..	29.43	1.34	18.8	24.2	21.6	55	— 5	28.8	14.5	14	18	84	79	1.27	.30
Mar ..	29.30	.86	34.4	37.1	36.8	64	21	42.8	30.9	27	27	75	72	2.23	1.63
Apr ..	29.34	1.02	46.0	46.0	46.4	83	23	53.2	39.7	36	36	71	70	1.45	.43
May .	29.28	.60	56.6	61.3	59.5	90	36	67.8	51.2	45	47	67	61	4.52	1.50
June .	29.33	.71	63.2	66.6	66.2	86	42	73.6	58.7	56	57	77	73	2.29	.48
July .	29.32	.56	70.4	73.7	72.0	93	56	80.3	63.7	60	62	71	67	0.98	.32
Aug ..	29.42	.50	66.6	70.7	69.8	87	52	78.6	61.0	56	58	68	66	1.25	.51
Sept .	29.37	.77	60.2	64.2	64.0	90	40	71.8	56.1	52	54	75	71	1.84	.74
Oct ..	29.43	.80	45.6	49.4	48.3	76	27	54.9	41.7	37	37	72	65	1.27	.86
Nov ..	29.38	1.16	38.8	41.3	41.0	68	16	46.6	35.3	33	34	80	77	1.71	.44
Dec ..	29.42	.88	39.6	42.1	41.6	70	20	48.8	34.3	33	33	79	72	3.65	1.59
Year .	29.36	.88	47.5	50.8	49.9	93	— 5	57.1	42.8	39	41	75	71	24.89	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

SAN ANTONIO, TEX.

[H=781. T=17. h=1[illegible].]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	6.1	8.5	34	N.	N.	22	12	5	6	9	3	3	2	0	6	11	14	14	0	4	0	2	0
Feb ..	8.0	7.3	26	NE.	NE.	9	17	4	15	8	1	2	0	0	3	5	20	12	0	0	0	0	0
Mar ..	6.0	9.1	36	NW.	N.	17	14	1	10	12	4	4	0	0	10	8	13	7	0	0	0	4	0
Apr ..	5.8	7.9	34	NE.	SE.	9	7	6	25	9	2	1	1	0	7	11	12	9	0	0	0	6	0
May ..	5.8	9.1	24	SE.†	SE.	5	7	5	30	14	0	1	0	0	7	11	13	5	0	0	0	2	0
June .	7.4	7.4	36	E.	SE.	1	11	5	27	13	3	0	0	0	0	18	12	11	0	0	8	9	0
July .	6.0	6.7	25	NE.	SE.	3	5	4	32	14	3	1	0	0	7	14	10	7	0	0	19	4	0
Aug ..	5.0	5.2	26	S.	SE.	4	19	12	23	3	0	1	0	0	7	22	2	7	0	0	18	5	0
Sept .	6.5	7.7	30	NE.	NE.	9	21	1	18	9	1	0	1	0	6	9	15	14	0	0	2	4	0
Oct ..	3.2	6.2	24	NE.	NE.	11	21	3	15	8	1	1	1	1	18	10	3	3	0	0	1	0	0
Nov ..	3.6	8.5	36	N.	N.	18	14	4	11	5	2	2	4	0	18	3	9	10	0	1	0	3	0
Dec ..	7.1	7.8	26	NE.	SE.	4	12	1	23	22	0	0	0	0	2	12	17	7	0	0	0	0	0
Year .	5.9	7.6	..	.....	SE.	112	160	51	235	126	20	16	9	1	91	134	140	106	0	5	48	39	0

SAN DIEGO, CAL.

[H=93. T=73. h=66.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	2.7	4.8	24	E.	NW.	5	13	11	3	1	2	8	18	1	19	4	8	5	0	0	0	0	0
Feb ..	2.6	5.7	26	W.	NE.	8	18	5	1	2	3	7	12	0	19	6	3	5	0	0	0	0	0
Mar ..	5.0	5.4	36	S.	NW.	12	8	2	4	2	6	11	13	4	14	8	9	6	0	0	0	2	0
Apr ..	4.4	5.6	18	W.†	W.	14	4	2	3	5	5	17	9	1	14	11	5	3	0	0	0	0	0
May .	6.0	5.9	22	SW.	W.	11	1	3	0	3	4	21	14	5	15	8	8	2	0	0	0	0	0
June .	7.2	5.5	16	W.	W.	13	0	1	0	11	7	16	8	4	10	9	11	1	0	0	0	0	0
July .	4.0	5.1	20	W.	W.	13	0	0	2	7	9	20	6	5	22	7	2	0	0	0	0	0	0
Aug ..	3.6	5.0	19	W.	N.	17	0	0	0	3	5	16	14	6	17	9	5	1	0	0	0	0	0
Sept .	2.1	5.1	24	NE.	NW.	12	3	1	1	8	3	12	13	4	22	6	0	0	0	0	2	0	0
Oct ..	3.5	4.7	24	SE.	NW.	12	8	7	3	7	5	8	12	0	16	13	2	5	0	0	0	0	0
Nov ..	3.3	4.4	28	NE.	NE.	9	23	4	2	3	3	7	9	0	16	9	5	3	0	0	0	0	0
Dec ..	6.0	4.7	24	S.	NW.†	7	10	6	4	11	2	9	11	2	10	6	15	19	0	0	0	0	0
Year .	4.2	5.2	..	.....	W.	133	88	42	23	63	54	152	139	32	194	96	73	50	0	0	2	2	0

SANDUSKY, OHIO.

[H=629. T=64. h=55.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	6.8	10.7	48	SW.	SW.	2	5	5	5	5	25	11	4	0	3	10	18	12	7	22	0	0	0
Feb ..	7.0	10.9	35	NW.†	SW.	3	4	7	4	4	15	10	8	1	0	9	19	11	15	28	0	0	1
Mar ..	5.8	9.4	30	NW.	NW.	6	9	12	2	1	10	7	15	0	1	17	13	9	1	16	0	1	0
Apr ..	6.6	10.0	33	NW.	E.†	5	11	11	4	8	4	9	8	0	5	11	14	9	0	2	0	1	0
May .	6.6	9.5	36	NW.	SW.	3	6	9	2	8	16	9	8	1	5	9	17	9	0	0	0	3	0
June .	7.2	8.2	27	NW.	SW.	1	1	12	5	3	24	6	8	0	2	10	18	14	0	0	0	3	0
July .	5.0	7.1	30	NW.	SW.	2	8	9	6	7	16	10	4	0	12	10	9	9	0	0	1	4	0
Aug ..	4.0	7.2	27	NW.	SW.	3	5	10	6	7	16	13	1	1	14	10	7	5	0	0	0	1	0
Sept .	5.3	8.8	27	NW.	E.	4	2	12	8	9	12	10	3	0	9	11	10	9	0	0	0	1	0
Oct ..	6.2	10.5	34	NW.	N.	17	7	4	5	5	8	10	5	1	9	8	14	8	0	2	0	1	0
Nov ..	8.4	9.0	34	NW.	SW.	2	3	9	3	5	16	15	5	2	3	5	22	16	1	8	0	0	0
Dec ..	7.1	9.8	46	NW.	SW.	3	1	7	2	6	23	12	7	1	3	13	15	14	1	9	0	3	0
Year .	6.3	9.3	..	.....	SW.	51	62	107	52	68	185	122	76	7	66	123	176	125	25	87	1	18	1

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

SAN FRANCISCO, CAL.

[Lat., 37° 48′ N.; Long., 122° 26′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	*In.*	*In.*	°	°	°	°	°	°	°	°	°	%	%	*In.*	*In.*
Jan ..	30.02	.77	45.8	52.7	50.4	64	40	56.5	44.3	41	42	84	68	1.28	0.81
Feb ..	30.06	.71	48.3	56.7	54.0	75	39	61.2	46.8	44	42	85	61	0.72	0.59
Mar ..	29.90	.99	52.2	59.0	57.2	79	47	63.5	50.9	49	49	88	70	7.78	3.08
Apr ..	29.98	.49	53.7	59.3	58.8	77	49	65.0	52.6	48	49	83	70	0.96	0.30
May .	29.92	.56	53.0	60.5	58.8	88	48	65.4	52.1	49	50	87	69	2.17	1.29
June .	29.87	.29	55.1	61.1	60.2	75	52	66.3	54.2	52	52	89	74	0.03	0.03
July .	29.88	.35	53.4	59.8	58.8	83	50	65.1	52.5	51	52	92	76	0.01	0.01
Aug ..	29.85	.35	54.2	61.2	60.4	80	49	67.7	53.0	51	52	90	73	T	T
Sept .	29.88	.42	57.1	64.5	64.6	89	51	73.4	55.7	52	51	84	66	T	T
Oct ..	29.93	.71	57.6	62.6	61.8	87	51	68.0	55.5	53	53	84	72	7.28	2.03
Nov ..	30.03	.49	54.5	60.6	58.6	77	47	64.9	52.4	48	48	80	66	2.90	0.92
Dec ..	29.93	.78	48.7	51.9	51.3	63	40	55.6	47.0	45	46	88	79	13.81	1.46
Year .	29.94	.58	52.8	59.2	57.9	89	39	64.4	51.4	49	49	86	70	36.94	.....

SANTA FÉ, N. MEX.

[Lat., 35° 41′ N.; Long., 105° 57′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	23.17	.63	18.5	26.4	24.6	46	0	34.2	15.1	8	10	65	52	.84	.26
Feb ..	23.22	.70	22.5	33.1	29.6	50	— 1	39.6	19.7	13	19	67	58	.53	.25
Mar ..	23.22	.51	32.9	46.2	41.6	66	20	52.5	30.8	22	20	66	40	.80	.34
Apr ..	23.26	.51	41.4	57.5	51.6	75	26	64.9	38.2	26	23	57	31	.44	.26
May ..	23.25	.52	48.9	64.5	56.4	80	32	69.5	43.4	30	26	50	27	.15	.13
June .	23.33	.37	58.0	71.3	64.2	86	37	76.7	51.8	38	26	49	23	.63	.20
July .	23.38	.32	62.8	76.1	70.5	90	52	82.9	58.1	46	39	57	31	1.32	.55
Aug ..	23.42	.30	61.4	75.3	70.9	88	54	83.3	58.5	43	38	51	28	1.43	.55
Sept .	23.36	.48	50.3	65.2	61.0	83	29	73.6	48.5	34	26	57	28	.67	.34
Oct ..	23.36	.64	43.1	55.4	52.1	78	28	63.1	41.1	26	25	56	37	.37	.24
Nov ..	23 31	.54	27.7	37.1	35.2	60	13	45.3	25.0	13	17	57	48	.45	.23
Dec ..	23.32	.61	34.6	40.7	39.8	59	10	48.3	31.4	22	20	61	46	.26	.10
Year .	23.30	.51	41.8	54.1	49.8	90	— 1	61.2	38.5	27	24	58	37	7.89	.....

SAULT DE STE. MARIE, MICH.

[Lat., 46° 28′ N.; Long., 84° 22′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.24	1.67	17.3	22.6	20.4	42	—13	26.6	14.3	14	18	88	84	2.50	.76
Feb ..	29.34	1.28	1.8	10.5	7.0	32	—19	15.9	—1.9	— 2	4	85	78	2.67	1.18
Mar ..	29.26	.71	24.8	30.0	28.7	55	8	36.1	21.3	20	24	85	81	.31	.08
Apr ..	29.28	.93	35.2	39.8	39.8	64	10	48.9	30.8	29	30	81	70	2.37	.92
May .	29.24	.54	45.6	48.4	48.7	84	29	58.0	39.4	39	38	78	69	2.54	.78
June .	29.26	.82	51.8	56.9	55.4	85	38	65.1	45.7	47	50	86	78	5.83	1.50
July .	29.26	.70	59.0	63.3	62.2	88	45	72.0	52.5	55	55	86	76	3.36	1.03
Aug ..	29.34	.68	57.4	60.9	61.2	84	43	69.4	53.1	54	54	87	79	3.07	1.40
Sept .	29.26	.88	53.4	56.8	56.6	80	34	64.1	49.1	50	51	88	82	5.60	1.30
Oct ..	29.43	1.09	35.4	39.1	39.0	57	21	45.1	32.8	31	34	86	82	1.86	.85
Nov ..	29.30	1.16	29.3	33.0	32.8	49	13	38.6	27.0	26	27	91	80	1.84	.80
Dec ..	29.28	1.19	26.8	28.9	27.6	42	3	33.0	22.2	23	24	87	82	3.44	.42
Year .	29.29	.97	36.5	40.8	40.0	88	—19	47.7	32.2	32	34	86	78	35.39	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

SAN FRANCISCO, CAL.

[H=60. T=70. h=60.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
1889.																							
Jan ..	3.7	5.0	36	NE.	N.	17	8	2	1	5	6	4	15	4	13	13	5	7	0	0	0	0	0
Feb ..	2.8	6.0	32	NW.	W.	10	1	1	5	3	5	16	14	1	13	14	1	6	0	0	0	0	0
Mar ..	5.6	8.6	32	NE.	SW.	3	1	0	14	10	18	13	1	2	4	20	7	16	0	0	0	3	0
Apr ..	6.1	8.7	30	W.	W.	2	0	0	0	4	21	28	4	1	3	22	5	11	0	0	0	0	0
May .	5.0	10.0	32	W.	SW.	1	0	0	1	5	31	22	2	0	4	23	4	11	0	0	0	0	0
June .	5.6	10.9	32	SW.	SW.	0	0	0	0	4	45	11	0	0	3	24	3	1	0	0	0	0	0
July .	5.9	12.2	36	SW.	SW.	0	0	0	0	1	47	14	0	0	6	15	10	0	0	0	0	0	0
Aug ..	4.3	11.0	32	W.	SW.	0	0	0	0	8	39	14	0	1	13	16	2	0	0	0	0	0	0
Sept .	3.6	8.1	27	SW.	SW.	1	0	1	0	9	33	13	0	3	16	6	8	0	0	0	0	0	0
Oct ..	5.3	8.2	32	SW.	SW.	1	1	1	4	16	21	13	4	1	10	10	11	13	0	0	0	0	0
Nov ..	4.3	5.9	34	N.	N.	9	2	3	4	10	7	10	14	1	13	9	8	7	0	0	0	0	0
Dec ..	7.1	7.7	32	SE.	SE.	7	0	4	10	19	8	9	4	1	2	13	16	24	0	0	0	0	0
Year .	4.9	8.5	..	.....	SW.	51	13	12	39	94	281	167	58	15	100	185	80	96	0	0	0	3	0

SANTA FÉ, N. MEX.

[H=7,026. T=35. h=29.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	2.7	5.9	36	SE.	NE.	11	27	3	9	1	2	1	3	5	21	5	5	9	10	30	0	0	0
Feb ..	4.0	6.6	30	N.	N.	17	15	1	6	5	8	1	3	0	15	4	9	6	5	28	0	0	0
Mar ..	5.2	6.7	38	NE.	NE.	8	12	9	2	8	11	1	9	2	7	17	7	8	0	17	0	0	0
Apr ..	4.0	7.8	32	N.	NE.	7	12	10	7	2	9	7	6	0	9	13	8	6	0	2	0	3	0
May .	4.2	8.8	40	W.	SW.	10	8	4	11	4	14	7	2	2	7	22	2	3	0	0	0	2	0
June .	3.8	7.4	48	N.	SE.	5	9	5	14	7	5	6	6	3	12	14	4	9	0	0	0	1	0
July .	5.0	6.6	31	N.	NE.	6	14	10	10	7	8	3	2	2	11	15	5	12	0	0	0	5	0
Aug ..	4.9	5.7	28	E.	E.	5	10	18	7	6	6	3	0	7	7	22	2	9	0	0	0	2	0
Sept .	4.7	7.0	46	N.	E.	8	9	14	7	7	4	4	5	2	15	8	7	3	0	2	0	0	0
Oct ..	4.6	6.5	36	N.	E.	8	9	16	7	3	13	2	4	0	16	11	4	4	0	3	0	0	0
Nov ..	4.8	7.7	28	NE.	NE.	16	22	7	4	1	4	4	1	1	13	12	5	5	1	25	0	0	0
Dec ..	6.4	5.6	36	SW.	E.	5	18	21	8	3	2	1	4	0	6	10	15	7	3	16	0	0	0
Year .	4.5	6.9	..	.....	NE.	106	165	118	92	54	86	40	45	24	139	153	73	81	19	123	0	13	0

SAULT DE STE. MARIE, MICH.

[H=642 T=56. h=48.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	7.4	7.0	28	SW.	E.	4	5	16	6	3	4	10	5	9	1	9	21	18	18	30	0	0	0
Feb ..	6.0	7.2	*	NW.	N.	17	3	9	6	1	5	4	8	3	5	9	14	15	25	28	0	0	0
Mar ..	6.6	7.5	34	NW.	NW.	5	2	3	8	6	0	8	28	2	0	14	17	12	8	29	0	0	0
Apr ..	6.8	7.0	24	NW.	NW.	4	3	7	12	3	1	11	15	4	5	8	17	10	0	16	0	0	0
May	7.0	7.6	31	NE.	NW.	7	6	6	7	5	4	11	13	3	2	11	18	14	0	4	0	4	0
June .	6.7	6.0	32	SW.	S.	7	5	4	9	11	3	7	8	6	2	12	16	13	0	0	0	4	0
July .	6.8	5.2	22	SE.	NW.	4	1	2	9	12	2	9	15	8	6	7	18	11	0	0	0	2	0
Aug ..	7.4	5.1	20	W.	NW.	4	2	6	14	4	3	7	15	7	4	5	22	13	0	0	0	2	0
Sept .	7.5	5.9	23	SE.	SE.	2	0	4	23	5	6	3	12	5	3	6	21	16	0	0	0	4	0
Oct ..	6.7	5.6	22	NW.	NE.	6	17	5	11	1	2	1	9	10	4	10	17	10	1	11	0	0	0
Nov ..	7.9	6.4	30	NE.	NW.	2	9	9	4	0	4	7	10	15	3	7	20	14	6	22	0	0	0
Dec ..	9.2	8.9	31	NW.	SE.	1	3	3	27	1	0	2	21	4	0	4	27	20	11	27	0	0	0
Year .	7.2	6.6	..	.....	NW.	63	56	74	136	52	34	80	159	76	35	102	228	166	69	167	0	16	0

* 132 miles for 5 minutes, at 5 p. m., February 22, 1889.

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

SAVANNAH, GA.

[Lat., 32° 5′ N.; Long., 81° 5′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	29.99	.84	47.4	52.5	51.7	69	29	58.9	44.5	44	46	87	80	6.36	1.98
Feb ..	30.11	.85	43.9	49.2	48.0	81	24	55.3	40.7	38	42	81	78	3.92	2.03
Mar ..	29.88	.99	51.0	56.8	56.3	77	34	65.0	47.6	43	46	76	71	3.52	1.34
Apr ..	29.92	.65	60.3	63.7	65.0	86	42	74.8	55.2	52	53	75	72	2.36	1.23
May .	29.93	.51	69.0	73.8	73.6	96	50	84.2	63.0	56	56	65	57	0.35	0.25
June .	30.00	.49	74.7	75.4	76.0	96	50	83.8	68.1	67	68	78	78	9.73	3.10
July .	29.96	.28	79.2	78.9	81.0	95	70	88.2	73.8	73	73	83	82	6.21	2.58
Aug ..	30.02	.26	75.5	75.9	77.8	90	64	85.0	70.6	71	71	87	86	7.50	2.60
Sept .	29.96	.53	71.7	74.6	75.0	91	55	83.0	67.0	66	67	82	79	4.68	2.15
Oct ..	29.99	.57	57.8	64.7	64.3	87	42	74.5	54.1	52	54	81	71	0.34	0.34
Nov ..	30.05	.82	54.1	58.6	59.2	83	29	67.5	50.8	50	52	87	78	2.58	1.13
Dec ..	30.18	.50	51.6	59.5	59.8	77	32	70.0	49.5	48	52	89	78	T.	T.
Year .	30.00	.61	61.4	65.3	65.6	96	24	74.2	57.1	55	57	81	76	47.55	.....

SHREVEPORT, LA.

[Lat., 32° 30′ N.; Long., 93° 43′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.82	.74	43.1	51.8	47.9	69	25	56.1	39.7	38	39	82	65	4.02	.84
Feb ..	29.92	.80	43.9	54.6	50.2	81	27	58.8	41.5	35	38	73	56	2.03	.71
Mar ..	29.74	.98	50.8	62.9	58.6	83	39	67.8	49.5	43	43	75	52	3.05	1.34
Apr ..	29.74	.65	61.0	73.9	69.0	87	52	79.2	58.7	55	56	82	55	6.91	2.68
May .	29.77	.52	64.9	75.6	71.3	88	50	80.9	61.7	59	59	82	57	2.70	1.88
June .	29.74	.46	71.4	80.3	76.8	93	55	86.0	67.7	67	69	87	70	7.97	2.20
July .	29.74	.32	77.2	83.9	82.8	96	70	91.5	74.0	73	74	88	74	3.43	1.21
Aug ..	29.80	.21	72.8	83.4	79.9	95	65	90.0	69.8	68	70	86	66	1.75	.68
Sept .	29.76	.67	67.5	76.1	74.2	92	55	83.2	65.3	64	66	89	72	3.51	1.46
Oct ..	29.84	.60	55.6	69.5	65.5	86	39	77.0	54.0	51	55	84	60	1.06	1.04
Nov ..	29.88	.96	44.7	53.6	51.6	77	29	61.2	42.0	41	42	86	67	9.10	2.57
Dec ..	29.91	.68	57.5	65.2	63.2	78	34	71.0	55.3	54	57	88	75	.64	.30
Year .	29.80	.63	59.2	69.2	65.9	96	25	75.2	56.6	54	56	84	64	46.17	.....

FORT SILL, IND. T.

[Lat., 34° 40′ N.; Long., 98° 23′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	28.83	.87	30.7	40.9	39.2	71	18	49.6	28.9	26	32	84	72	2.71	1.00
Feb ..	28.90	1.09	29.0	42.4	39.7	76	7	52.4	27.0	25	30	85	62	.87	.66
Mar ..	28.76	1.11	42.9	56.5	52.0	79	25	62.9	41.2	39	41	86	59	1.68	.74
Apr ..	28.74	.67	54.7	68.4	63.3	88	41	75.3	51.3	48	50	79	54	1.90	1.16
May .	28.70	.80	61.3	71.8	68.1	92	38	78.5	57.7	56	57	83	60	3.63	1.23
June .	28.73	.63	66.5	76.8	73.0	94	54	83.0	62.8	64	68	91	74	4.26	1.56
July .	28.71	.44	72.6	84.5	79.9	103	60	90.7	69.1	69	70	89	62	1.87	.73
Aug ..	28.78	.30	69.7	81.7	78.4	102	59	89.9	66.8	67	70	93	69	3.82	1.45
Sept .	28.78	.80	59.6	70.2	68.6	94	38	79.8	57.4	58	60	93	72	4.69	2.00
Oct ..	28.82	.70	52.8	62.5	62.4	94	35	74.2	50.6	49	51	89	69	2.82	1.80
Nov ..	28.90	1.04	34.3	45.7	44.2	78	20	55.8	32.7	31	35	88	67	1.12	.56
Dec ..	28.84	.87	43.0	54.9	53.8	77	21	66.2	41.3	40	43	89	68	T.	T.
Year .	28.79	.78	51.4	63.1	60.2	103	7	71.5	48.9	48	51	87	66	29.37	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

SAVANNAH, GA.

[H=87. T=66. h=6.]

Month and year.	Mean cloudiness (in tenths).	Wind.														Number of days.								
		Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan	6.3	7.5	30	W.	NW.	9	10	2	0	6	6	11	14	4	6	7	18	13	0	2	0	0	0
Feb	6.6	7.6	26	NE.	NW.	5	9	1	0	6	8	12	13	2	6	8	14	10	0	3	0	0	0
Mar	4.1	8.7	46	NW.	NW.	6	6	3	5	10	4	11	16	1	15	8	8	9	0	0	0	0	0
Apr	3.2	7.9	36	W.	S.	4	4	2	7	17	5	10	9	2	17	7	6	6	0	0	0	3	0
May	2.6	8.1	25	W.	NW.	2	1	3	8	13	10	9	16	0	19	10	2	2	0	0	6	3	0
June	6.2	7.6	32	N.	S.	7	4	0	13	18	7	5	4	2	6	7	17	12	0	0	4	5	0
July	6.6	7.0	24	SW.	SW.	0	3	1	7	22	21	6	2	0	6	11	14	15	0	0	12	8	0
Aug	6.8	5.4	38	NW.	NE.	4	13	7	9	13	10	2	2	2	4	14	13	18	0	0	1	11	0
Sept	4.7	5.4	26	SE.	W.	8	10	4	10	8	7	9	3	1	9	14	7	8	0	0	2	5	0
Oct	2.9	5.9	22	N.	N.	10	3	3	11	9	9	8	9	0	18	11	2	2	0	0	0	0	0
Nov	4.4	6.9	32	NE.	W.	1	6	7	1	10	8	16	10	1	13	9	8	9	0	1	0	0	0
Dec	2.4	5.6	22	W.	W.	1	8	3	6	8	6	25	4	1	2	9	1	0	0	0	0	0	0
Year	4.7	7.0	...	.....	S.	57	77	36	77	140	101	124	102	16	140	115	110	104	0	6	25	35	0

SHREVEPORT, LA.

[H=240. T=77. h=76.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	5.6	7.9	36	NW.	NW.	9	4	2	12	10	2	5	18	0	10	10	11	13	0	4	0	1	0
Feb	5.6	7.2	30	NW.	SE.†	3	6	10	12	12	2	5	5	1	9	11	8	6	0	2	0	1	0
Mar	4.4	7.5	36	NW.	NE.	3	14	2	9	10	7	4	12	1	16	8	7	10	0	0	0	3	0
Apr	3.7	6.7	35	SW.	S.	5	5	4	8	17	7	4	8	2	17	11	2	9	0	0	0	9	0
May	3.8	7.2	34	SE.	S.	6	4	1	9	22	5	1	13	1	11	16	4	7	0	0	0	5	0
June	5.6	5.4	44	NW.	S.	1	10	3	13	20	2	4	5	2	10	13	7	14	0	0	4	9	0
July	5.8	4.7	25	E.	SW.†	1	4	2	11	15	15	9	2	3	3	20	8	16	0	0	22	15	0
Aug	3.9	4.6	36	S.	SE.	4	10	8	30	4	1	2	0	3	14	14	3	7	0	0	16	5	0
Sept	6.0	5.4	31	S.	SE.	8	11	4	16	12	0	2	4	3	7	12	11	10	0	0	4	5	0
Oct	1.6	6.1	38	NW.	NE.	5	17	1	11	8	6	3	11	0	27	3	1	2	0	0	0	2	0
Nov	4.6	7.9	30	W.	NW.	1	8	5	9	9	1	11	16	0	14	7	9	11	0	1	0	2	0
Dec	5.0	6.5	24	NW.	S.	1	2	5	10	27	11	3	1	2	4	23	4	4	0	0	0	1	0
Year	4.6	6.4	...	.....	S.	47	95	47	150	166	59	53	95	18	142	148	75	109	0	7	46	58	0

FORT SILL, IND. T.

[H=1,200. T=10. h=3.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	3.3	9.1	40	N.	N.	29	0	0	5	15	0	1	2	10	18	5	8	8	1	22	0	1	0
Feb	3.2	9.8	42	S.	N.	21	2	2	1	16	0	1	2	11	18	3	7	7	2	19	0	0	0
Mar	3.6	11.1	48	S.	N.	35	1	0	1	18	1	0	0	6	15	6	10	9	0	2	0	4	0
Apr	2.2	11.8	46	S.	N.	24	4	2	4	21	1	0	0	4	22	6	2	7	0	0	0	5	0
May	4.0	12.6	48	S.	S.	15	3	1	7	31	0	0	0	5	15	9	7	13	0	0	1	6	0
June	4.4	9.7	84	E.	S.	16	5	1	7	26	2	0	0	3	11	9	10	17	0	0	6	10	0
July	3.4	9.8	46	SW.	S.	14	3	3	3	31	2	0	0	6	15	12	4	8	0	0	17	4	0
Aug	2.3	8.6	38	S.	SE.	7	6	5	20	10	0	0	1	13	20	9	2	7	0	0	13	5	0
Sept	4.7	10.1	38	N.	S.	16	2	0	6	28	1	0	0	7	10	15	5	10	0	0	3	1	0
Oct	3.4	9.6	40	W.	S.	15	7	3	4	16	2	1	5	9	17	8	6	6	0	0	2	0	0
Nov	2.9	8.9	32	S.	N.	29	2	0	0	8	1	0	4	16	18	7	5	7	0	15	0	2	0
Dec	2.2	10.2	48	S.	S.	17	0	0	1	31	1	1	2	9	21	7	3	0	0	3	0	0	0
Year	3.3	10.1	...	.....	S.	238	35	17	59	251	11	4	16	99	200	96	69	99	3	61	42	38	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

SIOUX CITY, IOWA.

[Lat., 42° 29′ N.; Long., 96° 24′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan	......	.....	.....	.....	.....	....	....	.....	.....	....	....	....	....	.....	.....
Feb	......	.....	.....	.....	.....	....	....	.....	.....	....	....	....	....	.....	.....
Mar	......	.....	.....	.....	.....	....	....	.....	.....	....	....	....	....	.....	.....
Apr	......	.....	.....	.....	.....	....	....	.....	.....	....	....	....	....	.....	.....
May	......	.....	.....	.....	.....	....	....	.....	.....	....	....	....	....	.....	.....
June	......	.....	.....	.....	.....	....	....	.....	.....	....	....	....	....	.....	.....
July	28.72	.45	71.4	79.3	76.1	92	58	82.7	69.5	61	64	70	61	3.31	.81
Aug	28.78	.52	64.9	77.1	73.2	92	55	83.6	62.9	59	62	83	61	1.19	.59
Sept	28.75	.78	52.1	64.6	61.0	85	36	72.7	49.3	48	48	85	57	1.71	1.13
Oct	28.90	.69	40.5	53.4	50.4	84	22	61.5	39.2	33	34	76	51	.21	.13
Nov	28.88	.97	25.5	34.3	33.0	58	2	42.2	23.8	21	24	85	67	1.99	1.12
Dec	28.74	1.23	29.8	36.3	35.2	62	5	44.1	26.3	23	26	77	67	1.14	.69
Year	......	.....	.....	.....	.....	....	....	.....	.....	....	....	....	....	.....	.....

SPOKANE FALLS, WASH.

[Lat., 47° 40′ N.; Long., 117° 25′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan	28.13	.86	20.5	27.3	24.2	40	2	30.3	18.2	19	24	95	87	1.85	0.42
Feb	28.16	.76	24.3	32.9	29.0	53	6	36.3	21.8	22	26	92	77	0.34	0.22
Mar	27.98	1.00	36.8	55.3	46.8	72	25	38.9	34.6	31	38	83	56	1.93	0.73
Apr	27.97	.71	42.0	63.4	52.8	79	31	65.7	40.0	35	29	78	32	0.55	0.24
May	27.91	.81	49.1	67.0	59.0	86	38	70.9	47.2	40	34	73	36	1.70	0.36
June	27.96	.48	54.7	78.0	65.2	91	40	79.9	50.4	40	27	60	18	0.39	0.35
July	27.91	.67	59.1	85.1	72.0	96	44	87.7	56.2	42	32	55	18	0.46	0.39
Aug	27.91	.54	53.5	77.2	65.2	90	41	79.9	50.6	42	43	65	32	.22	.16
Sept	28.04	.70	43.9	69.1	56.8	86	26	71.7	42.0	35	35	73	30	.37	.26
Oct	27.99	.87	45.6	58.0	52.4	86	31	62.1	42.6	41	42	85	61	2.01	.51
Nov	28.10	.90	32.4	41.1	37.7	53	22	45.7	29.7	29	30	88	67	.42	.15
Dec	27.90	.91	26.5	30.4	28.2	42	—10	33.7	22.6	24	27	93	87	4.03	.78
Year	28.00	.77	40.7	57.1	49.0	96	—10	60.2	38.0	33	32	78	50	14.27	.....

SPRINGFIELD, ILL.

[Lat., 39° 48′ N.; Long., 89° 39′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan	29.37	1.04	26.0	32.1	30.8	58	2	37.9	23.6	21	24	82	73	2.13	1.15
Feb	29.48	1.34	20.0	27.7	25.4	56	— 5	33.7	17.1	14	18	78	69	1.64	0.63
Mar	29.34	.69	36.7	46.3	43.3	73	22	52.5	34.1	30	32	77	61	1.97	0.89
Apr	29.34	.91	47.6	58.1	54.1	78	26	64.1	44.1	38	42	69	56	0.71	0.44
May	29.30	.54	56.4	63.9	60.8	88	35	70.1	51.6	47	51	72	66	6.64	3.30
June	29.32	.67	63.7	70.6	67.7	90	42	76.9	58.5	58	62	82	74	3.65	1.27
July	29.30	.47	70.1	77.5	74.6	91	56	83.7	65.7	64	66	81	69	2.14	0.83
Aug	29.42	.41	65.0	75.5	72.3	90	54	82.8	61.8	57	61	77	62	0.78	0.34
Sept	29.36	.71	58.1	64.9	64.4	88	37	73.4	55.4	54	56	86	73	4.74	2.09
Oct	29.45	.77	43.6	53.8	51.0	80	30	60.1	41.9	39	43	86	67	2.86	1.85
Nov	29.42	1.05	34.1	39.4	38.2	59	7	44.4	31.9	30	33	84	77	4.05	1.81
Dec	29.40	.92	40.1	46.3	44.4	67	14	52.5	36.2	35	39	83	76	2.00	1.51
Year	29.38	.79	46.8	54.7	52.2	91	— 5	61.0	43.5	41	44	80	69	33.31	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

SIOUX CITY, IOWA.

[H = 1,158. T = 89 h = 78.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
1889.																							
Jan	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Feb	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mar	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Apr	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
May	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
June	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
July	4.9	7.7	48	S.	NW.	9	7	7	11	6	1	0	12	9	11	10	10	10	0	0	3	8	0
Aug	3.9	10.0	48	S.	SE.	7	3	4	21	9	3	1	3	11	16	8	7	8	0	0	2	3	0
Sept	4.5	10.0	42	S.	S.	5	7	4	7	15	7	3	11	1	12	11	7	10	0	0	0	1	0
Oct	4.9	9.3	36	SW.	SE.	8	12	9	13	8	2	0	9	1	13	9	9	6	0	4	0	0	0
Nov	4.8	9.0	32	NW.	NW.	6	6	1	12	9	1	1	18	6	11	10	9	6	5	24	0	0	0
Dec	2.9	10.8	48	NW.	S.	8	3	8	8	18	1	2	11	3	7	11	13	6	2	23	0	1	0
Year	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

SPOKANE FALLS, WASH.

[H = 1,921. T = 41. h = 35.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
Jan	7.0	2.5	15	SW.	NE.	2	14	11	1	4	13	5	7	5	2	6	23	10	16	31	0	0	0
Feb	7.8	2.7	20	E.	NE.	1	14	8	1	1	12	7	6	6	0	10	18	5	7	25	0	0	0
Mar	4.3	4.1	18	E.	SW.	0	9	16	1	1	19	4	6	6	8	15	8	8	0	8	0	0	0
Apr	6.3	5.0	27	SW.	SW.	1	9	11	1	3	24	4	7	0	1	18	11	6	0	1	0	0	0
May	6.8	5.5	24	W.†	SW.	0	10	5	2	10	22	11	1	1	3	11	17	14	0	0	0	3	0
June	4.6	5.2	26	SW.	SW.	3	9	6	7	3	18	9	4	1	9	13	8	3	0	0	3	0	0
July	3.2	4.5	21	W.	NE.	1	15	10	2	2	12	13	5	2	17	14	0	3	0	0	16	2	0
Aug	3.6	5.6	24	SW.	W.	0	3	9	3	7	6	12	1	1	11	7	3	2	0	0	0	0	0
Sept	4.4	5.7	29	SW.	SW.	0	11	0	1	3	25	9	6	5	13	11	6	4	0	2	0	0	0
Oct	7.3	4.5	30	SW.	SW.	0	12	12	2	8	13	1	3	11	2	14	15	13	0	1	0	0	0
Nov	6.7	3.6	24	SW.	SW.	2	10	10	1	4	14	3	4	12	7	8	15	10	0	21	0	0	0
Dec	8.8	2.8	20	SW.	SW.	0	14	2	0	2	21	1	3	19	1	5	25	19	8	26	0	0	0
Year	5.9	4.3	...	...	SW.	10	130	100	22	48	199	79	53	69	74	132	149	97	31	115	19	5	0

SPRINGFIELD, ILL.

[H = 644. T = 80. h = 64.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
Jan	5.0	10.0	40	W.	NW.	4	6	2	4	8	12	11	15	0	9	8	14	7	9	29	0	0	0
Feb	5.3	10.9	36	NW.	NW.	6	3	4	7	5	6	9	15	1	7	10	11	9	12	25	0	0	0
Mar	5.4	9.3	36	NE.	NW.	9	14	2	4	6	5	7	15	0	9	8	14	4	0	9	0	1	0
Apr	5.4	10.2	36	W.	NE.	5	13	6	5	12	4	6	9	0	8	10	12	8	0	1	0	4	0
May	6.6	10.7	36	S.	S.	12	8	2	3	17	7	7	6	0	4	10	17	11	0	0	0	6	0
June	6.4	6.7	26	SW.	S.	7	2	2	9	17	9	8	5	1	5	14	11	11	0	0	0	10	0
July	3.7	6.7	25	SW.	S.	5	5	8	9	14	7	3	10	1	14	12	5	8	0	0	3	9	0
Aug	2.8	5.2	30	SW.	SW.†	4	4	7	7	9	9	0	8	14	19	9	3	3	0	0	0	4	0
Sept	4.6	6.2	28	NW.	S.	3	5	2	5	16	4	6	8	11	9	17	4	13	0	0	0	8	0
Oct	4.5	7.4	24	E.	N.	16	14	7	5	6	4	2	6	2	15	8	8	7	0	3	0	1	0
Nov	6.4	9.1	31	NE.	NW.	6	8	3	2	7	9	8	15	2	9	7	14	11	2	11	0	0	0
Dec	5.5	9.9	42	W.	S.	5	3	3	5	20	6	13	7	0	10	10	11	7	1	7	0	0	0
Year	5.1	8.5	...	...	S.	82	85	48	65	137	82	80	119	32	118	123	124	99	24	85	3	43	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

SPRINGFIELD, MO.

[Lat., 37° 12′ N.; Long., 93° 18′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	28.60	.87	29.4	36.9	35.5	60	4	44.1	26.9	26	29	86	76	2.45	0.93
Feb ..	28.70	1.08	26.5	34.6	32.6	65	1	41.7	23.4	22	26	84	75	4.38	1.38
Mar ..	28.58	.96	38.8	48.4	46.2	74	19	55.6	36.8	34	37	83	68	5.92	2.86
Apr ..	28.58	.76	49.9	61.1	57.2	82	35	67.2	47.3	42	45	77	57	4.41	1.71
May .	28.56	.58	57.1	65.9	62.8	86	37	73.1	52.6	51	54	82	66	4.84	1.26
June .	28.60	.61	63.6	70.9	69.0	90	48	78.3	59.6	59	61	84	72	5.80	1.34
July .	28.58	.36	71.5	78.3	76.9	92	56	86.0	67.8	67	67	85	70	6.53	2.33
Aug ..	28.68	.28	66.3	74.7	73.0	89	57	82.7	63.4	61	65	84	72	2.70	1.06
Sept .	28.62	.67	58.2	64.8	64.4	86	38	73.1	55.6	54	57	87	77	2.01	0.34
Oct ..	28.68	.73	48.2	57.4	56.6	84	32	66.9	46.4	43	45	82	66	2.25	2.02
Nov ..	28.66	1.00	34.3	41.9	41.0	71	14	49.2	32.7	30	33	86	72	5.62	1.50
Dec ..	28.66	.90	45.6	52.3	51.8	74	13	61.2	42.4	41	44	84	74	1.05	0.46
Year .	28.62	.73	49.1	57.3	55.6	92	1	64.9	46.2	44	47	84	70	47.96	....

FORT STANTON, N. MEX.

[Lat., 33° 30′ N.; Long., 105° 26′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	23.90	.59	22.7	32.9	29.6	54	5	41.4	17.9	15	16	72	52	1.33	.66
Feb ..	23.93	.71	29.1	40.7	36.0	57	13	46.9	25.1	18	17	65	40	.39	.21
Mar ..	23.93	.48	35.5	47.9	41.8	72	20	53.2	30.4	22	19	61	39	.86	.28
Apr ..	23.95	.74	47.1	62.2	52.8	77	25	67.1	38.5	25	21	46	25	.24	.20
May .	23.94	.53	52.7	68.6	59.0	83	32	73.7	44.4	24	17	37	19	.17	.10
June .	24.00	.42	56.6	73.4	64.9	91	37	78.4	51.4	41	36	61	33	2.51	1.69
July .	24.05	.33	61.4	75.7	69.3	92	50	81.9	56.7	52	54	73	48	2.36	.49
Aug ..	24.08	.28	58.7	75.6	68.2	90	46	83.2	53.2	48	47	67	38	.89	.51
Sept .	24.04	.50	53.3	64.1	59.4	86	33	71.6	47.3	42	44	67	51	2.76	.80
Oct ..	24.07	.62	42.5	57.9	52.8	79	23	67.0	38.7	34	40	72	52	1.90	.97
Nov ..	24.04	.55	28.7	40.2	38.2	66	10	52.0	24.5	22	29	76	65	1.04	.46
Dec ..	24.03	.65	33.7	47.2	43.7	68	5	58.5	28.9	26	34	73	60	.04	.04
Year .	24.00	.53	43.5	57.4	51.3	92	5	64.6	38.1	31	31	64	44	14.49	....

FORT SULLY, S. DAK.

[Lat., 44° 39′ N.; Long., 100° 39′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	28.33	.98	12.4	20.7	16.8	45	—19	26.0	7.7	7	15	78	78	.70	.18
Feb ..	28.40	1.25	10.8	18.3	15.0	47	—22	24.6	5.4	6	12	80	75	.46	.19
Mar ..	28.36	.81	28.4	42.7	38.0	71	10	49.7	26.2	22	24	78	52	.59	.46
Apr ..	28.30	.85	42.4	57.7	51.8	85	27	64.0	39.5	33	34	70	44	2.86	1.82
May .	28.23	1.41	48.6	62.5	55.4	85	25	66.7	44.0	40	42	74	50	2.96	.92
June .	28.24	.63	60.4	75.1	67.8	99	46	80.3	55.4	53	53	77	50	1.64	.48
July .	28.22	.63	64.8	78.7	72.3	105	50	83.8	60.8	57	58	78	52	3.35	.86
Aug ..	28.24	.68	62.8	82.4	74.0	107	48	88.4	59.7	54	54	74	39	1.01	.96
Sept .	28.26	.80	50.4	63.0	60.2	98	36	72.6	47.7	40	41	70	48	1.09	.56
Oct ..	28.38	.78	40.0	53.9	50.2	85	20	63.1	37.4	32	35	76	51	.08	.04
Nov ..	28.40	1.06	19.8	31.5	28.4	64	— 6	39.6	17.3	13	19	76	63	.19	.10
Dec ..	28.24	1.03	20.8	29.2	27.6	53	— 6	37.6	17.5	15	21	80	72	.36	.22
Year .	28.30	.91	38.5	51.3	46.5	107	—22	58.0	34.9	31	34	76	56	15.29	....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

SPRINGFIELD, MO.

[H=1,356. T=78. h=74.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Number of days. Partly cloudy.	Number of days. Cloudy.	Number of days. Rainy.	Number of days. Max. below 32°.	Number of days. Min. below 32°.	Number of days. Max. above 90°.	Number of days. Thunder storms.	Number of days. Auroras.
1889.																							
Jan..	4.3	10.0	36	SW.	SE.	7	6	4	13	9	3	7	12	1	6	16	9	9	4	22	0	1	0
Feb..	4.2	10.1	36	NW.	NW.	4	5	10	8	7	3	5	12	2	9	11	8	10	7	18	0	1	0
Mar..	4.7	9.8	30	N.	NW.†	10	13	5	7	6	3	4	13	1	7	14	10	10	0	8	0	3	0
Apr..	4.2	10.0	42	N.	N.	16	5	5	10	5	8	3	8	0	10	9	11	10	0	0	0	8	0
May..	4.2	10.9	36	SE.	S.	8	2	1	7	22	5	7	10	0	9	15	7	10	0	0	0	3	0
June.	5.4	7.0	42	NW.	SE.	5	6	3	18	15	4	5	2	2	3	21	6	15	0	0	0	9	0
July.	4.7	7.1	36	SW.	SE.	8	7	5	15	9	10	3	2	2	7	20	4	12	0	0	7	11	0
Aug..	3.6	6.8	42	NW.	SE.	3	6	16	23	6	3	0	2	3	16	12	3	7	0	0	0	5	0
Sept.	5.4	8.4	34	NW.	SE.	11	3	5	21	13	3	1	3	0	11	7	12	14	0	0	0	3	0
Oct..	4.9	9.2	36	NW.	E.	11	4	14	13	8	3	3	6	0	13	7	11	8	0	0	0	5	0
Nov..	6.3	9.8	30	SE.	NW.	7	9	7	9	3	6	4	15	0	7	12	11	12	1	11	0	1	0
Dec..	5.2	11.3	38	SW.	S.†	4	4	5	12	14	14	1	8	0	9	15	7	7	0	4	0	2	0
Year.	4.8	9.2	..	......	SE.	94	70	80	157	117	65	43	93	11	107	159	99	124	12	63	7	52	0

FORT STANTON, N. MEX.

[H=6,150. T=37. h=2.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan..	3.7	7.1	26	W.†	W.	6	0	0	0	10	5	24	13	4	10	17	4	6	2	20	0	0	0
Feb..	3.4	9.7	64	SW.	NW.†	2	2	1	3	9	5	17	17	0	12	11	5	5	0	21	0	0	0
Mar..	4.6	8.2	44	W.	W.	4	4	2	3	10	7	23	7	2	7	18	6	7	0	21	0	0	0
Apr..	2.8	8.2	35	W.	W.	4	1	2	2	13	4	25	8	1	14	14	2	4	0	1	0	2	0
May..	2.9	9.1	63	SW.	W.	3	3	5	2	6	9	21	6	4	12	17	2	2	0	0	0	0	0
June.	4.5	6.5	36	NW.	W.	2	2	4	3	11	6	17	8	7	3	23	4	4	0	0	1	1	0
July.	4.2	4.6	28	SW.	W.	0	1	4	6	7	7	17	4	16	5	21	5	8	0	0	1	2	0
Aug..	2.8	4.9	36	SW.	SE.	2	1	0	17	7	17	7	0	11	10	19	2	6	0	0	0	3	0
Sept.	4.4	5.5	25	W.	SE.	2	1	2	17	4	15	12	4	3	5	17	8	9	0	0	0	1	0
Oct..	3.4	6.0	35	W.	W.	3	1	1	10	8	10	12	5	12	15	11	5	5	0	3	0	0	0
Nov..	2.5	6.1	36	NW.	W.	3	1	1	5	3	6	17	11	13	23	2	5	4	2	26	0	0	0
Dec..	3.4	6.1	48	SW.	SW.	0	0	0	3	1	19	13	4	22	15	13	3	1	1	20	0	0	0
Year.	3.6	6.8	..	......	W.	31	17	22	71	89	110	208	87	95	131	183	51	61	5	122	2	9	0

FORT SULLY, S. DAK.

[H=1,600. T=15. h=2.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan..	3.1	8.2	45	NW.	NW.	3	1	12	3	0	1	4	34	4	15	8	8	10	20	31	0	0	0
Feb..	4.4	9.8	66	NW.	NW.	5	2	11	5	1	0	3	28	1	12	7	9	7	17	27	0	0	0
Mar..	3.8	8.8	41	NE.	NW.	10	2	14	4	1	0	0	27	4	15	8	8	2	3	23	0	0	3
Apr..	5.4	12.2	60	NW.	NW.	5	7	9	10	0	1	0	26	2	9	13	8	5	0	7	0	2	2
May..	4.9	9.6	36	N.†	NW.	6	5	8	11	2	4	9	17	0	9	11	11	8	0	1	0	4	0
June.	4.1	9.3	34	NE.	SE.	5	1	3	25	2	5	5	14	0	15	10	5	12	0	0	4	10	0
July.	4.8	9.4	46	NW.	SE.	7	2	6	19	0	4	8	14	2	7	18	6	13	0	0	5	14	0
Aug..	3.0	9.2	38	W.	SE.	6	1	9	26	0	0	5	13	2	20	10	1	3	0	0	12	4	0
Sept.	4.2	11.1	50	NW.	NW.	5	3	10	14	0	2	7	19	0	16	6	8	7	0	0	3	7	0
Oct..	4.3	9.1	31	NW.	SE.	4	2	12	21	1	0	1	21	0	16	6	9	4	0	5	0	0	2
Nov..	3.1	7.6	36	NW.	NW.	1	1	15	12	0	1	6	24	0	19	7	4	3	10	28	0	0	2
Dec..	4.7	7.0	42	NW.	NW.	4	4	8	19	0	1	4	22	0	13	10	8	6	12	31	0	0	0
Year.	4.2	9.3	..	......	NW.	61	31	117	169	7	19	52	259	15	166	114	85	80	62	153	24	41	9

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

TITUSVILLE, FLA.

[Lat., 28° 34′ N.; Long., 80° 51′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	30.06	.53	59.3	60.7	60.4	79	35	66.8	53.9	56	56	88	86	10.52	1.95
Feb ..	30.16	.52	54.8	58.0	57.0	83	38	64.0	50.0	52	53	90	84	5.49	1.74
Mar ..	29.97	.76	58.7	62.1	61.5	82	41	69.6	53.4	54	54	83	77	1.57	.54
Apr ..	30.00	.46	66.8	69.1	68.1	86	48	76.8	59.4	60	62	80	79	2.00	.70
May .	30.01	.41	72.9	73.9	73.1	92	53	83.4	62.8	63	64	71	73	.79	.50
June .	30.06	.46	77.6	77.5	78.3	94	61	84.4	72.2	72	72	83	85	11.62	2.06
July .	30.06	.24	80.1	78.6	80.2	93	70	87.4	73.1	75	74	86	87	7.59	2.17
Aug ..	30.06	.25	78.9	78.7	79.4	93	67	85.8	73.0	75	74	87	88	3.30	.90
Sept .	29.98	.39	79.3	79.0	79.4	89	66	85.4	73.3	73	73	82	83	2.87	1.64
Oct ..	30.04	.37	67.1	70.0	69.4	88	49	78.5	60.4	62	63	83	80	2.05	1.25
Nov ..	30.10	.51	61.7	67.1	67.4	85	38	75.4	59.4	61	62	86	83	.97	.60
Dec ..	30.22	.25	58.3	64.8	63.7	78	48	73.1	54.3	56	60	93	84	.03	.02
Year .	30.06	.43	68.2	70.0	69.8	94	35	77.6	62.1	63	64	84	82	48.80	....

TOLEDO, OHIO.

[Lat., 41° 40′ N.; Long., 83° 34′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.28	1.44	28.3	32.5	31.6	58	12	37.9	25.2	23	26	83	78	1.50	.62
Feb ..	29.39	1.36	17.8	23.1	21.0	54	— 5	29.0	13.1	14	18	84	81	.97	.25
Mar ..	29.27	.82	33.3	39.2	38.2	64	18	45.9	30.6	26	29	75	70	1.87	1.24
Apr ..	29.30	1.01	44.6	48.1	47.7	81	21	56.4	39.0	35	37	71	66	1.32	.44
May .	29.25	.63	55.1	61.4	59.3	89	34	68.3	50.3	44	45	69	58	3.93	1.98
June .	29.30	.71	62.0	66.4	65.5	85	42	73.8	57.2	56	57	80	73	3.26	.91
July .	29.28	.53	68.5	75.0	72.0	91	55	81.7	62.3	60	61	75	63	1.14	.39
Aug ..	29.38	.51	63.7	72.1	69.3	90	52	79.6	59.0	56	56	75	57	1.59	.42
Sept .	29.33	.77	56.9	63.6	62.8	88	36	72.3	53.2	50	52	79	67	.52	.22
Oct ..	29.40	.81	42.8	49.7	47.8	78	26	56.3	39.4	33	34	70	58	.84	.42
Nov ..	29.34	1.14	37.6	40.6	40.5	63	14	46.4	34.6	33	34	85	80	2.28	.17
Dec ..	29.38	.99	37.6	41.6	41.4	70	20	49.3	33.4	32	33	82	73	2.62	.54
Year .	29.32	.89	45.7	51.1	49.8	91	— 5	58.1	41.4	38	40	77	69	21.84	....

VALENTINE, NEBR.

[Lat., 42° 50′ N.; Long., 100° 32′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	27.28	.91	15.4	26.5	24.6	58	—10	39.1	10.2	9	18	76	73	.....	.34
Feb ..	27.34	1.05	16.6	26.6	24.8	66	—15	38.0	11.7	9	17	74	69	.15	.10
Mar ..	27.32	.81	29.7	48.6	44.0	81	10	60.7	27.2	22	32	75	54	1.05	.86
Apr ..	27.30	.85	43.6	57.1	51.8	82	23	64.1	39.5	36	39	77	55	3.87	1.12
May .	27.23	1.25	47.7	60.7	54.6	84	23	66.7	42.5	40	47	78	63	2.05	.53
June .	27.26	.53	59.4	72.6	65.6	92	43	77.4	53.7	52	54	78	54	2.99	1.63
July .	27.26	.51	63.8	78.0	71.6	106	44	83.4	59.9	55	58	74	55	2.60	1.27
Aug ..	27.29	.60	62.0	80.1	73.0	98	46	86.7	59.2	54	55	77	43	.34	.20
Sept .	27.28	.81	47.6	64.4	58.4	97	33	72.1	44.7	40	46	77	57	1.71	.08
Oct ..	27.36	.71	40.6	52.8	49.8	86	22	62.4	47.1	35	41	81	68	2.12	1.60
Nov ..	27.38	.91	22.6	33.4	31.5	67	— 2	43.9	19.1	14	21	76	62	.56	.24
Dec ..	27.22	.88	28.8	36.5	35.6	66	— 5	47.8	23.3	17	20	63	54	.84	.76
Year .	27.29	.82	39.8	53.1	48.8	106	—15	61.9	35.7	3[illegible]	37	7[illegible]	59	19.55	....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

TITUSVILLE, FLA.
[H=44. T=16. h=1.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan	6.6	9.3	26	NE.	NW.	8	6	3	10	5	5	9	12	4	5	9	17	14	0	0	0	2	0
Feb	6.3	9.5	36	N.	NW.	7	2	1	6	3	6	5	24	2	6	9	13	14	0	0	0	0	0
Mar	3.6	7.8	35	SE.	W.	5	5	3	9	1	5	19	14	1	18	7	6	7	0	0	0	0	0
Apr	2.6	8.4	36	N.	W.	6	5	5	12	2	7	13	10	0	19	7	4	5	0	0	0	0	0
May	1.8	8.3	30	N.	W.†	5	7	5	14	3	1	14	13	0	24	4	3	5	0	0	4	3	0
June	5.2	12.5	48	W.	SE.	7	3	14	17	2	6	10	1	0	6	13	11	19	0	0	4	3	0
July	6.5	9.4	42	SE.	SW.	1	1	13	13	11	19	3	1	0	6	9	16	19	0	0	5	7	0
Aug	6.7	9.8	35	NE.	SE.	3	8	12	18	2	7	7	5	0	1	18	12	17	0	0	1	0	0
Sept	5.5	11.7	47	E.	E.	6	11	19	8	6	3	3	3	1	9	13	8	13	0	0	0	0	0
Oct	3.6	10.2	38	NW.	NW.	6	5	5	6	2	1	13	22	2	19	9	3	5	0	0	0	2	0
Nov	4.1	8.5	29	S.	NW.	6	5	4	8	5	3	3	21	5	16	11	3	6	0	0	0	0	0
Dec	3.6	6.6	24	NW.	NW.	13	14	2	5	0	0	9	15	4	20	11	0	2	0	0	0	0	0
Year	4.7	9.3	..	.....	NW.	73	72	86	126	42	63	108	141	19	149	120	96	126	0	0	14	17	0

TOLEDO, OHIO.
[H=674. T=122. h=113.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	7.0	11.2	55	SW.	SW.	2	6	4	4	11	13	12	9	1	9	4	18	14	7	24	0	0	0
Feb	6.6	11.2	32	NW.†	NW.	0	8	8	1	4	10	12	13	0	4	6	18	11	14	28	0	0	0
Mar	6.4	9.8	27	NW.	NW.	6	12	10	1	2	4	8	19	0	9	6	16	9	1	14	0	0	0
Apr	6.3	10.5	39	SE.	NW.	3	12	12	4	2	4	5	18	0	11	4	15	14	0	5	0	3	0
May	7.4	10.5	36	NE.†	SW.	5	6	8	3	9	17	4	10	0	6	6	19	11	0	0	0	4	0
June	8.2	9.1	36	NW.	SW.	2	5	10	4	3	21	9	6	0	3	8	19	16	0	0	0	6	0
July	4.1	7.6	31	S.	SW.	7	6	9	7	5	13	9	6	0	14	13	4	10	0	0	0	3	0
Aug	3.1	7.6	26	SW.†	SW.	2	1	9	13	3	16	9	7	2	18	10	3	6	0	0	0	2	0
Sept	3.5	8.8	32	SE.	W.	3	4	12	6	7	10	13	4	1	16	12	2	6	0	0	0	1	0
Oct	5.1	8.3	28	SW.	NE.	7	13	2	5	4	10	5	10	6	10	12	9	7	0	0	0	1	0
Nov	6.6	10.7	33	W.	W.	1	10	4	5	4	14	15	7	0	7	6	17	15	2	11	0	0	0
Dec	5.7	11.3	48	SW.	SW.	1	10	4	6	7	18	11	5	0	11	7	13	13	0	9	0	1	0
Year	5.8	9.7	..	.....	SW.	39	93	92	59	61	150	112	114	10	118	94	153	132	24	91	0	21	0

VALENTINE, NEBR.
[H=2,613. T=41. h=31.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	2.5	9.8	60	NW.	W.	10	0	4	1	1	3	20	18	5	18	4	9	9	5	31	0	0	0
Feb	4.1	9.3	60	NW.	N.	15	5	1	2	6	3	11	4	9	14	3	11	3	11	27	0	0	0
Mar	3.7	8.6	42	N.	N.	22	3	5	0	9	9	7	1	6	17	5	9	4	0	24	0	0	0
Apr	5.3	11.8	54	NW.	N.	16	8	4	8	9	2	6	7	0	14	6	10	9	0	2	0	1	0
May	4.7	10.7	48	W.	NE.†	12	12	2	5	8	3	8	9	3	13	5	13	12	0	1	0	2	0
June	3.8	10.2	40	S.	N.	10	8	7	7	9	5	4	8	2	16	8	6	10	0	0	3	1	0
July	5.3	11.1	38	NE.	S.	14	9	2	6	17	4	3	3	4	14	7	10	8	0	0	6	4	0
Aug	4.0	10.6	60	W.	S.	6	8	4	12	19	4	6	2	1	18	10	3	6	0	0	13	2	0
Sept	5.3	11.8	48	N.	NW.	9	5	5	5	8	4	7	12	5	12	9	9	11	0	0	3	0	0
Oct	5.2	9.3	42	NW.	SE.	8	2	7	11	5	7	10	9	3	14	6	11	9	0	5	0	0	0
Nov	5.0	9.9	40	N.	W.	11	3	1	3	5	10	17	7	3	14	7	9	5	5	28	0	0	0
Dec	5.0	9.2	48	S.	W.	10	6	3	2	5	10	15	7	4	13	11	7	4	3	28	0	0	0
Year	4.5	10.2	..	.....	N.	143	69	45	62	101	64	114	87	45	177	81	107	90	24	146	25	10	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

VICKSBURG, MISS.

[Lat., 32° 22′ N.; Long., 90° 53′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a.m.	Temperature. 8 p.m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a.m.	Dew-point. 8 p.m.	Relative humidity. 8 a.m.	Relative humidity. 8 p.m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	29.85	.87	43.5	51.6	49.3	70	26	57.2	41.4	36	38	77	63	4.66	1.18
Feb ..	29.96	.87	43.8	52.2	49.4	79	24	58.1	40.8	36	36	75	57	.44	.18
Mar ..	29.76	.90	50.5	61.3	57.0	80	36	67.4	47.7	41	41	72	51	7.02	2.18
Apr ..	29.78	.83	60.7	70.9	67.3	86	46	78.1	56.5	53	51	77	53	3.53	2.14
May .	29.80	.61	65.2	75.0	71.2	92	48	82.1	60.3	57	57	76	54	1.17	.38
June .	29.78	.42	72.2	78.5	77.6	92	52	86.6	68.6	67	67	83	69	9.83	2.50
July .	29.78	.27	76.4	80.8	81.3	94	69	89.5	73.1	73	73	88	79	5.64	1.47
Aug ..	29.82	.23	73.5	79.5	79.6	92	66	89.0	70.2	69	71	85	75	2.13	.64
Sept .	29.78	.58	68.9	75.5	75.5	94	51	85.1	65.9	63	65	81	72	1.14	.56
Oct ..	29.86	.51	56.3	67.7	65.2	88	39	77.2	53.1	50	50	80	54	.16	.14
Nov ..	29.90	.97	46.4	54.2	53.2	85	30	62.7	43.8	40	40	81	63	4.59	1.18
Dec ..	29.96	1.62	56.3	65.5	63.6	79	34	72.8	54.3	52	51	86	61	.99	.99
Year .	29.84	.64	59.5	67.7	65.9	94	24	75.5	56.3	53	53	80	63	41.30	.....

WALLA WALLA, WASH.

[Lat., 46° 2′ N.; Long., 118° 20′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a.m.	Temperature. 8 p.m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a.m.	Dew-point. 8 p.m.	Relative humidity. 8 a.m.	Relative humidity. 8 p.m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.10	.89	26.0	30.5	28.7	52	11	34.3	23.1	23	26	91	86	0.47	0.16
Feb ..	29.13	.79	32.3	39.7	35.8	63	19	42.1	29.5	29	31	89	74	0.79	0.22
Mar ..	28.88	1.09	45.5	60.8	53.0	72	32	63.4	42.5	37	39	76	46	1.39	0.47
Apr ..	28.90	.70	48.5	65.5	57.0	84	36	68.3	45.7	37	38	66	39	1.51	0.52
May .	28.84	.81	54.1	68.2	61.8	91	42	72.6	50.9	44	44	69	46	4.04	1.79
June .	28.88	.59	60.2	81.5	70.5	100	47	84.1	56.9	40	35	50	22	1.33	1.27
July .	28.86	.69	66.6	90.2	78.0	100	50	91.6	64.4	45	34	47	16	T	T
Aug ..	28.88	.55	61.3	82.2	72.2	95	48	84.9	59.5	40	36	48	22	0.06	0.03
Sept .	28.98	.73	54.1	73.3	63.5	88	38	75.8	51.2	35	32	51	24	0.33	0.21
Oct ..	28.92	.95	49.8	60.2	56.2	80	37	65.2	47.1	42	43	74	58	0.88	0.31
Nov ..	29.06	.94	38.9	45.2	43.0	62	25	50.9	35.0	32	34	78	68	0.81	0.43
Dec ..	28.88	1.02	29.7	32.2	32.0	54	9	36.8	27.1	26	28	89	87	2.92	0.62
Year .	28.94	.81	47.2	60.8	54.3	100	9	61.2	44.4	36	35	69	49	14.53	.....

FORT WASHAKIE, WYO.

[Lat., 43° 1′ N.; Long., 108° 54′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a.m.	Temperature. 8 p.m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a.m.	Dew-point. 8 p.m.	Relative humidity. 8 a.m.	Relative humidity. 8 p.m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	24.42	.84	2.5	6.6	9.4	44	—16	23.2	—4.3	— 2	0	80	75	.75	.38
Feb ..	24.44	.87	9.2	21.7	16.4	47	—21	30.3	2.4	4	14	80	75	.25	.25
Mar ..	24.44	.86	28.5	47.6	37.9	63	7	52.0	23.8	21	27	74	46	.06	.06
Apr ..	24.45	.75	36.3	54.3	46.0	74	22	58.7	33.2	26	28	68	41	1.53	.76
May .	24.40	.86	41.9	58.0	50.2	81	27	63.5	37.0	32	32	70	40	.55	.29
June .	24.49	.53	49.7	69.3	59.6	90	33	74.1	45.2	40	38	71	39	2.60	1.27
July .	24.51	.54	56.1	79.6	67.4	93	41	83.9	50.8	42	34	62	23	.31	.19
Aug ..	24.52	.54	53.8	79.2	67.3	92	36	84.3	50.3	38	37	56	24	.31	.20
Sept .	24.50	.61	40.1	64.4	53.6	80	27	69.8	37.3	27	34	62	34	.14	.14
Oct ..	24.53	.57	36.8	52.6	46.7	81	33	59.4	34.0	26	32	65	49	.87	.52
Nov ..	24.51	.79	19.6	28.5	27.2	54	6	39.1	15.3	14	22	78	78	.71	.38
Dec ..	24.34	.70	24.2	31.4	30.5	53	— 8	40.8	20.2	16	17	71	59	.62	.31
Year .	24.46	.70	33.2	49.4	42.7	93	—21	56.6	28.8	24	26	70	49	8.70	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

VICKSBURG, MISS.

[H=222. T=60. h=54.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	5.6	6.9	36	W.	E.	11	9	15	11	6	1	3	4	2	7	9	15	12	0	3	0	1	0
Feb ..	6.8	5.8	24	NW.	NE.	7	13	10	6	11	0	1	4	4	6	7	15	6	0	2	0	0	0
Mar ..	4.6	6.6	35	SE.	NE.†	11	11	9	7	9	7	1	5	2	11	9	11	9	0	0	0	2	0
Apr ..	3.6	6.2	27	NW.	S.	6	8	7	11	14	2	3	6	3	11	13	6	6	0	0	0	3	0
May .	3.4	6.3	30	W.	S.	13	3	4	7	17	10	3	2	3	11	14	6	6	0	0	1	3	0
June .	5.9	5.5	30	SW.	SE.	4	7	7	17	15	5	2	2	1	4	13	13	12	0	0	3	6	0
July .	6.4	5.0	24	NW.	SW.†	2	1	12	11	16	16	3	0	1	4	16	11	18	0	0	18	9	0
Aug ..	4.5	4.1	25	NW.	E.	12	14	16	10	5	3	0	0	2	11	16	4	7	0	0	14	5	0
Sept .	5.1	4.7	21	N.	N.	15	13	9	11	5	4	1	0	2	10	9	11	6	0	0	10	5	0
Oct ..	2.2	5.2	32	NW.	N.	25	3	4	11	5	5	0	1	8	21	9	1	3	0	0	0	0	0
Nov ..	4.5	6.9	39	W.	SE.	7	9	4	14	6	6	5	5	4	13	10	7	11	0	2	0	1	0
Dec ..	4.5	6.3	21	N.	SE.	1	5	4	28	20	2	1	0	1	10	17	4	1	0	0	0	1	0
Year .	4.8	5.8	..	.....	SE.	114	96	101	144	129	61	23	29	33	119	142	104	97	0	7	46	36	0

WALLA WALLA, WASH.

[H=1,018. T=66. h=56.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	6.8	4.1	26	SW.	SW.	5	1	1	4	4	29	11	5	2	2	9	20	8	14	28	0	0	0
Feb ..	6.6	3.8	20	SW.	SW.	8	0	2	4	2	33	4	2	1	3	18	7	11	1	20	0	0	0
Mar ..	4.4	5.3	26	SW.	SW.	7	2	4	7	6	27	3	6	0	13	15	3	10	0	0	0	1	0
Apr ..	5.0	6.2	26	SW.	SW.	11	3	1	6	7	31	0	1	0	9	14	7	9	0	0	0	0	0
May .	4.8	6.1	32	SW.	SW.	7	4	3	8	8	23	5	3	1	11	15	5	15	0	0	2	4	0
June .	3.2	5.9	31	SW.	SW.	9	3	7	4	4	23	6	3	1	18	10	2	2	0	0	7	0	0
July .	0.5	5.9	26	S.	SW.	3	8	1	2	12	26	8	2	0	30	1	0	0	0	0	21	1	0
Aug ..	1.0	5.5	30	SW.	SW.	5	0	2	3	18	27	4	2	1	28	2	1	3	0	0	6	2	0
Sept .	1.9	5.8	34	SW.	SW.	5	0	1	8	11	26	6	2	1	20	8	2	3	0	0	0	0	0
Oct ..	5.1	3.3	32	SW.	SW.	8	1	3	3	8	23	3	0	13	9	10	12	12	0	0	0	1	0
Nov ..	5.2	4.1	28	SW.	SW.	4	0	3	3	7	25	2	0	16	9	10	11	11	0	12	0	0	0
Dec ..	8.5	4.6	28	SW.	SW.	4	0	2	4	5	38	6	3	0	1	6	24	18	11	18	0	0	0
Year .	4.4	5.0	..	.....	SW.	76	22	30	56	92	331	58	29	36	153	118	94	102	26	78	36	9	0

FORT WASHAKIE, WYO.

[H=5,580. T=23. h=16.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	2.0	3.8	24	NW.†	SW.	0	5	2	3	1	36	11	1	3	25	5	1	5	26	31	0	0	0
Feb ..	2.7	4.9	37	NE.	SW.	3	11	3	2	5	21	9	1	1	12	9	7	1	13	28	0	0	0
Mar ..	2.9	5.6	36	NW.	SW.	4	4	1	3	12	25	6	3	4	15	13	3	1	0	27	0	0	0
Apr ..	3.2	6.1	60	NW.	SW.	0	4	4	6	2	17	11	3	13	10	16	4	7	0	13	0	0	0
May .	3.8	5.4	47	W.	SW.	3	5	3	5	0	11	9	6	20	11	12	8	5	0	8	0	0	0
June .	3.6	5.6	35	SW.	SW.	3	4	2	4	5	15	11	3	13	14	10	6	11	0	0	0	2	0
July .	2.0	6.7	36	W.	SW.	3	7	5	1	4	18	15	3	6	23	7	1	2	0	0	5	0	0
Aug ..	2.1	5.6	42	NW.	SW.	0	9	1	1	1	22	15	5	8	26	4	1	4	0	0	2	0	0
Sept .	2.9	5.9	47	NW.	SW.	3	6	4	6	1	25	8	3	4	20	7	3	1	0	12	0	0	0
Oct ..	5.6	4.3	30	NW.	SW.	1	3	2	2	7	22	12	6	7	8	13	10	5	0	12	0	0	0
Nov ..	3.9	4.1	37	SW.	SW.	1	4	1	4	3	28	11	2	6	15	13	2	3	6	30	0	0	0
Dec ..	3.7	5.3	30	SW.	SW.	1	3	2	1	2	26	14	7	6	19	10	2	4	5	28	0	0	0
Year .	3.2	5.3	..	.....	SW.	22	65	30	38	43	266	132	43	91	198	119	48	49	50	189	7	2	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

WASHINGTON CITY.

[Lat., 38° 53′ N.; Long., 77° 1′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	29.94	1.37	34.4	39.2	39.2	66	23	46.6	31.7	28	30	78	70	4.05	1.26
Feb ..	30.06	1.31	27.0	31.9	31.1	54	4	37.5	24.7	20	20	76	62	2.47	.83
Mar ..	29.82	1.07	39.0	45.5	43.4	70	29	51.7	35.1	31	32	74	62	4.20	1.45
Apr ..	29.85	1.16	50.6	55.8	54.4	83	32	63.5	45.3	42	43	74	64	9.13	3.21
May .	29.86	.62	62.2	65.4	64.6	93	39	74.8	54.5	53	56	74	72	10.69	2.98
June .	29.93	.77	68.6	71.0	70.8	90	48	79.1	62.4	61	63	78	77	5.01	1.12
July .	29.88	.56	73.3	75.1	75.8	92	59	83.4	68.1	67	68	82	79	8.13	3.18
Aug ..	29.98	.53	69.2	71.9	72.4	90	55	81.3	63.6	62	65	78	80	3.07	1.17
Sept .	29.94	.76	62.9	64.9	65.6	86	42	73.4	57.9	57	59	83	81	3.88	1.55
Oct ..	29.95	.83	48.9	52.6	52.5	82	34	60.9	44.1	43	43	81	72	4.48	1.73
Nov ..	29.99	1.20	43.1	46.1	46.2	70	27	53.2	39.3	38	37	83	73	6.03	1.57
Dec ..	30.08	1.16	39.7	45.9	45.6	72	22	54.9	36.3	32	35	78	68	0.19	.05
Year .	29.94	.94	51.6	55.4	55.1	93	4	63.4	46.9	44	46	78	72	61.33	....

WHIPPLE BARRACKS, PRESCOTT, ARIZ.

[Lat., 34° 33′ N.; Long., 112° 28′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	24.68	.74	19.7	31.9	28.4	54	— 8	40.9	15.9	15	21	84	66	1.73	.99
Feb ..	24.72	.77	22.9	41.9	34.2	59	— 4	47.8	20.7	18	25	84	54	1.35	.62
Mar ..	24.70	.54	33.8	52.1	44.0	69	25	57.0	31.1	29	32	85	49	2.91	1.37
Apr ..	24.70	.46	40.3	64.9	53.4	82	30	69.3	37.6	25	21	57	23	.19	.14
May .	24.70	.48	47.4	70.8	59.2	86	29	74.4	43.9	22	21	41	16	T	T
June .	24.74	.24	53.1	80.2	66.6	91	40	83.6	49.5	30	28	42	17	.02	.02
July .	24.79	.24	63.8	81.2	74.6	100	54	88.3	60.8	52	51	67	41	1.45	.38
Aug ..	24.80	.24	62.0	80.7	73.4	94	55	87.2	59.6	51	52	68	41	1.51	.68
Sept .	24.77	.35	51.6	72.8	63.6	87	37	78.0	49.2	41	39	70	33	2.11	1.56
Oct ..	24.79	.40	43.2	61.0	54.4	87	28	68.2	40.5	33	33	70	38	1.76	1.43
Nov ..	24.80	.48	29.6	47.1	42.8	70	20	57.9	27.8	17	20	60	37	.42	.20
Dec ..	24.74	.48	37.5	43.0	42.2	58	18	50.1	34.3	31	35	78	74	7.38	1.41
Year .	24.74	.45	42.1	60.6	53.1	100	— 8	66.9	39.2	30	32	67	41	20.83	....

WICHITA, KANS.

[Lat., 37° 41′ N.; Long., 97° 20′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a. m.	Temperature. 8 p. m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a. m.	Dew-point. 8 p. m.	Relative humidity. 8 a. m.	Relative humidity. 8 p. m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	28.60	.92	26.1	35.8	32.8	54	10	42.1	23.4	22	25	84	68	.82	.70
Feb ..	28.69	1.28	22.9	35.0	31.5	72	— 2	42.6	20.4	18	22	80	63	.57	.35
Mar ..	28.58	1.01	37.3	51.5	46.5	75	17	58.0	35.0	32	35	82	56	2.41	.84
Apr ..	28.56	.86	49.4	63.4	57.8	90	36	68.9	46.8	40	43	72	52	5.18	1.84
May .	28.50	.86	58.0	69.0	64.7	88	37	74.8	54.6	51	53	79	60	3.88	1.07
June .	28.54	.70	64.4	73.7	70.3	94	51	80.5	60.1	60	62	86	68	7.89	1.96
July .	28.52	.41	70.7	81.3	77.4	96	57	87.1	67.8	66	68	85	66	4.72	1.75
Aug ..	28.60	.35	67.8	78.2	75.5	96	59	85.4	65.6	63	67	84	68	3.79	2.87
Sept .	28.58	.77	57.9	68.7	66.4	89	40	77.8	54.5	53	56	85	66	2.10	1.22
Oct ..	28.64	.77	48.7	58.6	56.4	91	34	65.9	47.0	42	47	80	67	2.14	.51
Nov ..	28.68	.97	31.6	40.9	39.4	72	15	48.7	30.2	27	30	84	65	1.14	.95
Dec ..	28.60	1.13	39.4	48.3	46.4	73	10	57.5	35.4	35	36	86	66	.03	.01
Year .	28.59	.84	47.3	58.7	55.4	96	— 2	65.8	45.1	42	45	82	64	34.67	....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

WASHINGTON CITY.

[H=112. T=59. h=42.]

Month and year.	Mean cloudiness (in tenths).	Wind: Average hourly vel. (miles).	Wind: Maximum (miles).	Wind: Direction.	Wind: Prevailing direction.	Wind: North.	Wind: Northeast.	Wind: East.	Wind: Southeast.	Wind: South.	Wind: Southwest.	Wind: West.	Wind: Northwest.	Wind: Calms.	Number of days: Cloudless.	Number of days: Partly cloudy.	Number of days: Cloudy.	Number of days: Rainy.	Number of days: Max. below 32°.	Number of days: Min. below 32°.	Number of days: Max. above 90°.	Number of days: Thunder storms.	Number of days: Auroras.
1889.																							
Jan ..	4.4	5.1	26	NW.	NW.	9	9	2	7	6	3	2	22	2	15	7	9	11	0	18	0	0	0
Feb ..	5.4	5.8	27	NW.	NW.	7	8	5	2	9	2	4	18	1	7	10	11	7	4	25	0	0	0
Mar ..	5.4	8.0	29	NW.	NW.	8	11	4	6	4	8	3	18	0	12	9	10	14	0	8	0	0	0
Apr ..	5.3	9.5	42	NW.†	NW.†	14	12	5	1	5	5	4	14	0	10	12	8	17	0	0	0	4	0
May ..	4.6	6.6	50	NW.	NW.	9	6	5	10	6	5	4	16	1	12	11	8	16	0	0	2	7	0
June .	6.5	5.8	25	NW.	S.	7	11	3	1	17	7	2	10	2	9	14	7	14	0	0	0	3	0
July .	5.5	5.9	26	NW.	S.	8	2	6	6	15	4	6	12	3	10	10	11	15	0	0	3	4	0
Aug ..	4.6	5.1	32	NW.	NE.	7	12	2	1	11	9	6	10	4	13	13	5	10	0	0	1	5	0
Sept .	5.7	7.6	28	N.	S.	9	4	5	4	14	3	7	12	2	8	10	12	15	0	0	0	1	0
Oct ..	6.3	6.3	30	NW.	NW.	10	8	3	2	7	2	1	16	13	8	8	15	10	0	0	0	1	0
Nov ..	6.8	5.4	32	NW.	NW.	4	6	1	3	4	2	6	12	22	6	8	16	17	0	7	0	2	0
Dec ..	5.1	6.0	36	NW.†	S.	5	10	0	5	16	3	5	15	3	10	12	9	7	0	10	0	0	0
Year .	5.5	6.4	.	.....	NW.	97	99	41	48	114	53	50	175	53	120	124	121	153	4	68	6	27	0

WHIPPLE BARRACKS, PRESCOTT, ARIZ.

[H=5,389. T=11. h=3.]

Month and year.	Mean cloudiness (in tenths).	Wind: Average hourly vel. (miles).	Wind: Maximum (miles).	Wind: Direction.	Wind: Prevailing direction.	Wind: North.	Wind: Northeast.	Wind: East.	Wind: Southeast.	Wind: South.	Wind: Southwest.	Wind: West.	Wind: Northwest.	Wind: Calms.	Number of days: Cloudless.	Number of days: Partly cloudy.	Number of days: Cloudy.	Number of days: Rainy.	Number of days: Max. below 32°.	Number of days: Min. below 32°.	Number of days: Max. above 90°.	Number of days: Thunder storms.	Number of days: Auroras.
Jan ..	2.9	6.7	52	SW.	S.	7	5	8	12	13	3	5	8	1	19	5	7	7	4	29	0	0	0
Feb ..	2.8	8.5	60	SW.	N.	16	6	6	1	4	8	3	11	1	18	2	8	5	2	25	0	0	0
Mar ..	3.6	9.4	60	SW.	SW.	5	5	2	7	6	23	6	7	1	6	17	8	9	0	16	0	2	0
Apr ..	2.6	10.9	48	SW.	SW.	3	1	0	11	6	21	13	5	0	15	10	5	3	0	2	0	2	0
May .	2.6	13.7	60	SW.	SW.	2	1	1	0	2	29	21	2	4	14	13	4	0	0	4	0	1	0
June .	1.8	10.6	42	NE.	W.	2	1	3	0	1	15	29	1	8	18	12	0	1	0	0	1	2	0
July .	4.5	9.6	40	SW.	SW.	0	3	3	2	1	33	12	1	7	11	12	8	11	0	0	11	15	0
Aug ..	4.1	7.6	36	SW.	SW.	0	3	6	0	0	23	22	5	3	14	14	3	13	0	0	8	12	0
Sept .	2.4	8.4	36	SW.	SW.	2	10	3	2	0	27	11	1	4	21	6	3	4	0	0	0	3	0
Oct ..	2.5	8.2	36	SW.	SW.	1	3	2	5	6	27	5	0	13	23	4	4	4	0	3	0	0	0
Nov ..	2.5	6.8	48	SW.	SW.	10	4	4	3	4	14	9	0	12	22	5	3	3	0	24	0	0	0
Dec ..	5.9	11.2	54	S.	SW.	1	7	0	2	15	29	3	0	5	11	5	15	15	0	11	0	0	0
Year .	3.2	9.3	..	.....	SW.	49	49	38	45	58	252	139	41	59	192	105	68	75	6	114	20	37	0

WICHITA, KANS.

[H=1,366. T=78. h=71.]

Month and year.	Mean cloudiness (in tenths).	Wind: Average hourly vel. (miles).	Wind: Maximum (miles).	Wind: Direction.	Wind: Prevailing direction.	Wind: North.	Wind: Northeast.	Wind: East.	Wind: Southeast.	Wind: South.	Wind: Southwest.	Wind: West.	Wind: Northwest.	Wind: Calms.	Number of days: Cloudless.	Number of days: Partly cloudy.	Number of days: Cloudy.	Number of days: Rainy.	Number of days: Max. below 32°.	Number of days: Min. below 32°.	Number of days: Max. above 90°.	Number of days: Thunder storms.	Number of days: Auroras.
Jan ..	3.0	9.4	46	N.	S.	17	3	1	8	19	4	2	8	0	16	9	6	3	3	29	0	1	0
Feb ..	4.2	9.4	46	NW.	N.	17	10	4	5	9	3	3	4	1	12	8	8	7	7	24	0	0	0
Mar ..	4.2	10.0	40	N.	N.	19	14	8	1	11	4	1	3	1	13	11	7	8	0	10	0	5	0
Apr ..	4.3	9.7	44	N.	S.	12	9	11	8	13	2	0	5	0	16	7	7	9	0	0	0	6	0
May .	5.0	11.9	44	S.	S.	10	5	4	2	27	4	3	6	1	10	13	8	11	0	0	0	12	0
June .	4.8	6.4	34	NW.	SE.	6	4	3	20	13	5	1	4	4	10	9	11	14	0	0	3	14	0
July .	5.5	7.4	36	W.	S.	10	6	5	11	23	4	1	0	2	6	15	10	9	0	0	10	4	0
Aug ..	3.7	7.4	26	S.	S.	5	8	4	18	24	1	0	0	2	14	13	4	6	0	0	2	6	0
Sept .	4.8	8.2	38	N.	S.	11	8	4	10	19	4	0	4	0	7	16	7	9	0	0	0	5	0
Oct ..	4.9	7.8	35	N.	N.	16	9	7	11	13	3	2	1	0	13	8	10	9	0	0	1	2	0
Nov ..	4.5	8.1	25	NW.	N.	19	8	4	7	9	0	1	11	1	13	9	8	6	1	17	0	0	0
Dec ..	4.5	8.8	45	S.	S.	7	9	1	12	20	5	0	7	1	14	10	7	3	0	8	0	0	0
Year .	4.4	8.7	..	.....	S.	149	93	56	113	200	39	14	53	13	144	128	93	94	11	88	16	55	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

WILMINGTON, N. C.

[Lat., 34° 14′ N.; Long., 77° 57′ W.]

Month and year.	Pressure.		Temperature.							Dew-point.		Relative humidity.		Precipitation.	
	Mean.	Range.	8 a. m.	8 p. m.	Mean (max. and min.).	Maximum.	Minimum.	Mean. Maximum.	Mean. Minimum.	8 a. m.	8 p. m.	8 a. m.	8 p. m.	Total.	Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	30.02	1.02	45.1	49.9	50.0	69	29	57.2	43.0	40	42	82	75	6.85	1.90
Feb ..	30.13	1.04	40.0	44.8	44.4	67	20	50.8	38.1	33	37	75	75	4.66	1.76
Mar ..	29.88	1.09	47.4	52.3	51.9	72	33	59.8	44.0	40	43	78	72	5.57	2.23
Apr ..	29.90	.88	58.0	59.6	60.6	86	42	69.4	51.9	50	51	77	75	2.13	0.58
May .	29.92	.51	68.1	70.6	70.9	97	45	80.4	61.4	61	60	78	72	4.24	1.42
June .	30.02	.58	73.8	74.7	75.5	93	58	81.5	69.5	68	70	83	85	6.03	2.20
July .	29.98	.39	77.8	77.2	79.0	94	66	85.5	72.5	72	73	84	86	11.10	3.32
Aug ..	30.05	.36	74.2	74.7	76.0	87	63	82.6	69.4	70	70	86	86	7.81	2.16
Sept .	29.98	.62	69.5	72.6	71.8	87	48	80.1	63.4	64	67	84	82	3.18	2.15
Oct ..	30.00	.60	56.7	60.9	60.9	83	37	70.0	51.8	52	56	86	83	3.87	2.96
Nov ..	30.07	.97	52.5	56.5	56.8	78	27	65.2	48.4	48	50	86	80	3.72	1.02
Dec ..	30.18	.68	48.8	55.0	56.0	76	30	66.4	45.6	45	49	86	82	0.15	0.15
Year .	30.01	.73	59.3	62.4	62.8	97	20	70.7	54.9	54	56	82	79	59.31	.....

WINNEMUCCA, NEV.

[Lat., 40° 58′ N.; Long., 117° 43′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temp. 8 a. m.	Temp. 8 p. m.	Mean (max. and min.).	Maximum.	Minimum.	Mean. Maximum.	Mean. Minimum.	Dew-point 8 a. m.	Dew-point 8 p. m.	Rel. hum. 8 a. m.	Rel. hum. 8 p. m.	Precip. Total.	Max. in 24 hours.
Jan ..	25.71	.76	14.4	29.2	21.6	49	—14	35.0	8.1	10	15	83	57	.32	.29
Feb ..	25.74	.92	22.9	41.8	32.4	62	2	46.6	18.1	16	19	75	42	T.	T.
Mar ..	25.61	.92	36.2	54.9	45.2	70	24	58.1	32.4	26	26	69	36	.47	.22
Apr ..	25.62	.65	41.1	62.6	51.8	80	21	66.2	37.5	23	20	52	26	.14	.12
May .	25.58	.65	46.5	67.3	56.8	91	30	69.6	44.1	29	25	54	28	.60	.20
June .	25.62	.36	56.8	81.7	68.6	93	41	84.6	52.5	25	18	32	12	.11	.09
July .	25.62	.41	58.6	89.5	72.9	102	47	90.8	55.0	16	9	21	6	T.	T.
Aug ..	25.62	.39	56.8	87.8	70.8	97	40	89.4	52.3	14	7	20	6	T.	T.
Sept .	25.72	.62	46.1	74.2	58.5	87	29	76.0	41.0	8	5	23	7	.00	.00
Oct ..	25.67	.73	41.3	59.7	50.9	87	24	64.2	37.6	23	19	54	28	.61	.38
Nov ..	25.76	.75	28.8	45.8	37.8	60	11	51.2	24.5	15	12	59	31	.10	.06
Dec ..	25.54	.76	28.5	33.9	31.2	52	—8	38.0	24.3	25	28	86	80	3.40	.78
Year .	25.65	.66	39.8	60.7	49.9	102	—14	64.1	35.6	19	17	52	30	5.75	.....

WOOD'S HOLL, MASS.

[Lat., 41° 33′ N.; Long., 70° 40′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temp. 8 a. m.	Temp. 8 p. m.	Mean (max. and min.).	Maximum.	Minimum.	Mean. Maximum.	Mean. Minimum.	Dew-point 8 a. m.	Dew-point 8 p. m.	Rel. hum. 8 a. m.	Rel. hum. 8 p. m.	Precip. Total.	Max. in 24 hours.
Jan ..	30.00	.45	33.8	36.5	36.0	56	14	41.5	30.5	29	32	83	85	3.91	1.32
Feb ..	30.08	.47	25.2	27.3	27.0	46	2	32.9	21.1	19	21	77	79	4.39	1.43
Mar ..	29.84	.47	34.8	35.6	36.2	52	25	40.8	31.6	29	31	80	84	2.87	0.83
Apr ..	29.97	1.05	43.4	43.6	45.0	60	34	50.6	39.4	38	38	83	83	4.44	1.28
May .	29.96	.77	54.5	53.5	55.0	72	40	61.5	48.6	50	50	84	90	5.33	2.49
June .	30.02	.89	62.7	61.9	63.2	77	50	68.4	58.1	59	59	89	92	1.96	0.86
July .	29.99	.61	67.2	65.9	67.5	79	56	72.8	62.2	63	64	86	92	3.63	1.37
Aug ..	30.06	.59	66.9	66.4	67.7	78	56	72.2	63.2	62	63	85	88	4.21	1.53
Sept .	30.04	.90	62.4	63.4	63.4	76	48	68.0	58.9	59	59	90	87	3.37	1.73
Oct ..	30.01	.80	50.1	50.9	50.8	65	35	56.0	45.5	44	45	81	82	4.49	1.11
Nov ..	30.05	1.33	44.8	45.9	45.6	62	25	50.2	41.1	40	42	84	86	5.45	1.12
Dec ..	30.12	1.61	38.7	40.5	39.8	54	21	45.4	34.2	34	35	86	82	2.06	0.55
Year .	30.01	.83	48.7	49.3	49.8	79	2	55.0	44.5	44	45	84	86	46.11	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

WILMINGTON, N. C.

[H=52. T=60. h=52.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan ..	5.4	7.5	38	SW.	NE.	6	14	5	2	2	7	12	3	11	8	8	15	10	0	2	0	0	0
Feb ..	6.0	7.5	36	SW.	SW.	6	14	2	1	1	18	3	8	3	8	5	15	10	0	6	0	1	0
Mar ..	4.1	7.0	26	NE.	N.	14	9	9	2	7	5	6	7	3	14	5	12	11	0	0	0	1	0
Apr ..	4.2	9.2	28	N.†	SW.	8	5	10	4	2	18	3	9	1	11	11	8	11	0	0	0	3	0
May .	3.5	7.3	30	S.	SW.	6	10	5	4	7	21	2	6	1	17	9	5	9	0	0	4	4	0
June .	6.0	7.0	27	S.	SW.	5	8	1	5	15	17	5	4	0	6	11	13	11	0	0	1	2	0
July .	5.7	6.9	36	SW.	SW.	4	4	4	4	16	20	8	1	1	6	14	11	21	0	0	6	11	0
Aug ..	5.3	5.4	24	SW.	SW.	11	8	7	8	5	14	6	2	1	10	12	9	17	0	0	0	6	0
Sept .	3.8	5.8	24	SW.†	N.	13	11	10	8	6	3	4	5	0	15	8	7	8	0	0	0	0	0
Oct ..	3.8	6.1	28	W.	N.	18	7	7	5	10	7	3	5	0	16	8	7	7	0	0	0	3	0
Nov ..	4.2	7.4	32	SW.	NE.	2	13	4	6	8	8	11	6	2	14	7	9	12	0	2	0	1	0
Dec ..	3.8	5.2	22	SW.	SW.	4	9	7	2	7	20	6	1	6	15	13	3	1	0	2	0	0	0
Year .	4.6	6.9	...	......	SW.	97	112	71	51	86	158	69	57	29	140	111	114	128	0	12	11	32	0

WINNEMUCCA, NEV.

[H=4,840. T=62. h=54.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	3.0	9.8	30	NE.	NE.	7	22	18	0	4	3	6	2	0	17	10	4	4	8	31	0	0	0
Feb ..	3.1	9.3	36	NW.	NE.	11	23	7	0	0	12	2	1	0	9	12	7	0	2	25	0	0	0
Mar ..	4.9	9.7	47	W.	W.	14	11	6	0	3	7	20	0	1	8	12	11	5	0	14	0	0	0
Apr ..	5.4	12.4	50	NW.	W.	11	7	5	0	5	9	20	1	2	10	8	12	3	0	7	0	0	0
May .	5.8	11.5	48	W.	W.	10	9	4	0	2	12	18	6	1	6	13	12	8	0	2	1	2	0
June .	2.8	10.3	48	S.	W.	4	8	10	0	2	11	19	5	1	17	6	7	2	0	0	5	1	0
July .	.1	10.4	36	W.	W.	1	5	10	0	6	11	23	5	1	27	4	0	0	0	0	15	0	0
Aug ..	1.7	9.7	54	SW.	W.	1	7	3	0	6	19	19	5	2	22	8	1	0	0	0	15	0	0
Sept .	1.3	9.7	40	SW.	W.	7	13	9	0	3	2	16	6	4	24	4	2	0	0	5	0	0	0
Oct ..	5.6	10.3	48	W.	SW.	7	9	11	0	6	15	7	3	4	6	12	13	7	0	7	0	0	0
Nov ..	4.8	11.0	58	S.	SW.	4	14	9	0	3	18	3	6	3	12	8	10	3	0	24	0	0	0
Dec ..	6.9	10.6	38	N.	SW.	15	13	3	4	4	17	1	3	2	6	10	15	24	4	27	0	1	0
Year .	3.8	10.4	...	......	W.	92	141	95	4	44	136	154	43	21	164	107	94	56	14	142	36	4	0

WOOD'S HOLL, MASS.

[H=22. T=51. h=39.]

Month and year.	Mean cloudiness (in tenths).	Average hourly vel. (miles).	Maximum (miles).	Direction.	Prevailing direction.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan ..	4.2	17.6	60	W.	NW.	4	9	0	9	6	7	11	16	0	12	10	9	11	2	12	0	0	0
Feb ..	4.0	17.7	50	W.	NW.	7	7	3	2	1	11	8	16	1	13	7	8	12	8	26	0	0	0
Mar ..	5.5	17.6	48	NW.	NE.	5	21	0	3	5	9	5	14	0	9	8	14	11	0	12	0	0	0
Apr ..	4.4	13.9	44	SW.	NE.	3	17	4	5	6	13	4	7	1	8	11	11	14	0	0	0	1	0
May .	3.6	11.9	40	SE.	SW.	1	5	6	11	8	22	4	4	1	10	14	7	9	0	0	0	3	0
June .	4.4	14.4	60	SW.	SW.	1	4	0	5	8	28	8	6	0	8	13	9	6	0	0	0	0	0
July .	5.3	12.2	36	SW.	SW.	6	10	2	10	8	17	6	3	0	10	10	11	12	0	0	0	2	0
Aug ..	5.2	11.7	36	SW.	NE.	5	19	2	5	2	17	7	5	0	13	7	11	8	0	0	0	2	0
Sept .	5.6	15.1	50	NW.	NE.	0	14	8	4	5	13	6	10	0	8	7	15	13	0	0	0	0	0
Oct ..	5.2	15.3	60	W.	NE.	8	20	1	7	3	10	2	11	0	12	6	13	9	0	0	0	0	0
Nov ..	5.9	16.8	63	SE.	NW.	8	2	5	10	2	2	15	16	0	8	10	12	13	0	4	0	0	0
Dec ..	5.5	17.8	60	NW.	NW.	5	8	5	3	8	5	11	17	0	10	12	9	13	2	13	0	0	0
Year .	4.9	15.2	...	......	SW.	53	136	36	74	62	154	87	125	3	121	115	129	131	12	67	0	8	0

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

YANKTON, S. DAK.

[Lat., 42° 54′ N.; Long., 97° 28′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a.m.	Temperature. 8 p.m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a.m.	Dew-point. 8 p.m.	Relative humidity. 8 a.m.	Relative humidity. 8 p.m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
1889.	In.	In.	°	°	°	°	°	°	°	°	°	%	%	In.	In.
Jan ..	28.74	1.15	14.5	21.7	20.0	47	—12	30.0	9.9	9	13	79	70	.96	.52
Feb ..	28.82	1.48	13.9	19.8	18.4	56	—18	28.8	8.1	8	10	77	68	.20	.09
Mar ..	28.75	.81	28.3	43.3	39.2	72	13	52.0	26.3	21	23	76	48	.27	.22
Apr ..	28.70	1.00	43.7	57.9	52.4	81	27	64.2	40.6	33	30	68	39	1.46	.64
May .	28.63	1.29	51.5	66.1	59.5	94	30	71.6	47.4	41	39	68	40	1.72	.54
June .	28.64	.71	61.9	74.1	69.0	93	44	81.6	56.5	54	54	76	52	2.68	1.22
July .	28.63	.49	67.3	77.2	73.2	98	50	83.6	62.8	60	62	78	61	4.54	1.63
Aug ..	28.69	.56	65.3	77.8	73.4	96	51	85.0	61.7	58	62	79	59	2.68	1.47
Sept .	28.66	.85	52.2	63.4	60.7	88	34	73.0	48.4	46	48	80	60	2.31	1.65
Oct ..	28.81	.70	40.5	52.7	50.4	80	22	62.8	37.9	34	37	80	57	.48	.25
Nov ..	28.81	.99	24.3	33.3	32.4	60	0	42.8	22.0	19	24	80	71	1.04	.65
Dec ..	28.66	1.09	26.7	34.7	34.4	60	3	44.2	24.6	22	26	84	73	1.37	1.30
Year .	28.71	.93	40.8	51.8	48.6	98	—18	60.0	37.2	34	36	77	58	19.71	.....

YUMA, ARIZ.

[Lat., 32° 45′ N.; Long., 114° 36′ W.]

Month and year.	Pressure. Mean.	Pressure. Range.	Temperature. 8 a.m.	Temperature. 8 p.m.	Temperature. Mean (max. and min.).	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean. Maximum.	Temperature. Mean. Minimum.	Dew-point. 8 a.m.	Dew-point. 8 p.m.	Relative humidity. 8 a.m.	Relative humidity. 8 p.m.	Precipitation. Total.	Precipitation. Max. in 24 hours.
Jan ..	29.87	.85	46.2	59.4	53.4	72	35	63.9	42.8	33	36	63	43	1.12	1.06
Feb ..	29.89	.73	50.2	68.5	58.8	78	34	71.4	46.3	33	33	55	29	.06	.06
Mar ..	29.78	.61	54.1	77.6	65.6	90	44	79.9	51.3	43	41	70	29	.24	.15
Apr ..	29.72	.44	60.0	86.9	73.5	104	46	90.1	56.9	43	41	56	22	.09	.00
May .	29.68	.31	62.8	91.3	77.6	107	50	94.3	60.8	47	39	58	18	.00	.00
June .	29.62	.31	72.1	99.7	85.6	109	63	102.2	69.1	53	42	53	15	T	T
July .	29.61	.36	80.7	103.6	92.0	117	67	106.3	77.8	66	58	63	24	T	T
Aug ..	29.62	.40	81.2	101.8	92.6	114	73	106.5	78.8	67	64	63	31	.25	.12
Sept .	29.68	.54	73.1	94.9	83.8	106	58	98.0	69.7	48	53	64	25	.00	.00
Oct ..	29.78	.29	62.0	80.8	72.6	106	47	86.9	58.2	49	48	66	35	.59	.59
Nov ..	29.90	.42	51.1	69.1	62.0	83	36	76.3	47.8	32	38	52	34	T	T
Dec ..	29.89	.42	52.2	61.5	58.2	73	38	66.6	49.9	49	51	89	69	2.43	1.01
Year .	29.75	.47	62.1	82.9	73.0	117	34	86.9	59.1	48	45	63	31	4.69	.....

MONTHLY AND YEARLY METEOROLOGICAL SUMMARIES—Continued.

YANKTON, S. DAK.

[H=1,234. T=35. h=26.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
1889.																							
Jan	3.1	7.5	41	NW.	NW.	3	2	5	4	1	4	10	25	8	16	10	5	5	16	31	0	0	0
Feb	3.6	8.6	60	NW.	NW.	3	3	2	2	5	7	9	21	4	13	9	6	8	14	28	0	0	0
Mar	3.2	8.0	32	NW.	NW.	10	4	5	5	5	4	4	20	5	17	10	4	3	3	25	0	0	0
Apr	4.2	10.4	48	NW.	NW.	11	1	6	13	7	5	2	15	0	11	13	6	6	0	4	0	1	0
May	4.7	8.8	56	S.	NW.	9	4	2	5	10	4	7	20	1	10	15	6	11	0	1	1	1	0
June	4.6	7.2	52	W.	S.	8	8	2	10	16	5	6	5	0	6	19	5	9	0	0	5	11	0
July	5.0	8.0	48	NE.	S.	12	2	7	11	13	3	8	5	1	12	8	11	11	0	0	5	6	0
Aug	4.2	7.5	36	W.	S.	1	1	1	18	20	1	3	10	7	12	13	6	5	0	0	6	5	0
Sept	4.6	8.1	27	NW.	NW.	2	2	2	11	12	2	10	15	4	13	8	9	7	0	0	0	1	0
Oct	5.6	6.6	31	NW.	SE.	6	6	8	16	9	1	2	11	3	9	8	14	4	0	6	0	0	0
Nov	5.0	7.5	29	NW.	NW.	9	1	2	6	9	6	7	16	4	12	8	10	6	7	27	0	0	1
Dec	6.2	7.5	45	N.	S.	4	3	7	7	16	6	3	14	2	7	10	14	4	4	26	0	1	0
Year	4.5	8.0	..	......	NW.	78	37	49	108	123	48	71	177	39	138	131	96	79	44	148	17	26	1

YUMA, ARIZ.

[H=141. T=16. h=1.]

Month and year.	Mean cloudiness (in tenths).	Wind. Average hourly vel. (miles).	Wind. Maximum (miles).	Wind. Direction.	Wind. Prevailing direction.	Wind. North.	Wind. Northeast.	Wind. East.	Wind. Southeast.	Wind. South.	Wind. Southwest.	Wind. West.	Wind. Northwest.	Wind. Calms.	Number of days. Cloudless.	Partly cloudy.	Cloudy.	Rainy.	Max. below 32°.	Min. below 32°.	Max. above 90°.	Thunder storms.	Auroras.
Jan	2.2	7.6	35	N.	N.	34	10	2	3	4	2	3	4	0	22	3	6	2	0	0	0	1	0
Feb	1.6	8.4	46	W.	N.	24	8	6	3	5	1	3	6	0	21	3	4	1	0	0	0	0	0
Mar	1.7	6.3	40	W.	NE.	11	15	4	7	8	7	6	4	0	21	6	4	5	0	0	0	0	0
Apr	1.2	7.0	36	N.†	W.	7	4	9	2	7	9	17	5	0	24	3	3	0	0	0	15	0	0
May	1.1	8.1	42	W.	W.	5	5	3	6	13	7	17	5	1	29	1	1	0	0	0	23	0	0
June	0.7	6.3	24	SW.	S.	3	5	4	5	21	8	10	2	2	28	2	0	0	0	0	28	0	0
July	1.4	8.1	38	S.	S.	0	4	3	12	24	5	9	0	5	26	4	1	0	0	0	31	1	0
Aug	2.6	6.8	36	S.	W.	0	1	4	7	16	11	20	1	2	23	5	3	3	0	0	31	3	0
Sept	0.8	6.6	30	N.	S.	10	9	3	5	11	8	9	1	4	29	0	1	0	0	0	25	0	0
Oct	1.9	4.8	34	N.	N.	13	4	5	9	6	7	10	6	2	23	6	2	2	0	0	8	1	0
Nov	1.7	6.3	42	N.	N.	32	9	6	2	4	3	3	1	0	25	4	1	0	0	0	0	0	0
Dec	5.5	4.4	33	N.	W.	11	12	4	7	7	2	14	4	1	9	12	10	9	0	0	0	0	0
Year	1.9	6.7	..	......	N.	150	86	53	68	126	70	121	39	17	280	49	36	22	0	0	161	6	0

APPENDIX 12.

TEMPERATURE DATA, 1889, *FROM REGULAR AND VOLUNTARY OBSERVERS.*

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, COMPILED FROM THE REPORTS OF REGULAR SIGNAL-SERVICE OBSERVERS, VOLUNTARY AND STATE WEATHER-SERVICE OBSERVERS, UNITED STATES POST SURGEONS, OBSERVERS OF THE NEW ENGLAND METEOROLOGICAL SOCIETY, AND OPERATORS AND AGENTS OF THE PACIFIC RAILWAY SYSTEM.

[NOTE.—Letters of the alphabet denote number of days missing from the record; thus "*c*" denotes that three days are missing. Interpolated values, derived from the data for adjacent stations, are given in brackets.]

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Alabama:	°	°	°	°	°	°	°	°	°	°	°	°	°
Auburn	46.9	46.3	54.0	62.6	70.2	76.1	80.6	77.6	73.6	62.2	53.2	57.8	63.4
Bermuda	47.0	47.5	50.1	61.3	67.8	70.6	76.9	75.4	72.3	61.1	54.2	57.0	61.8
Butler	44.9	48.0	....	67.0	....	77.8	80.9	77.5	....	....	53.5	59.2	....
Citronelle	51.9	51.0	59.5	65.0	71.3	79.4	82.1	80.0	79.4	[60.0]	[53.5]	64.2	[66.4]
Columbiana	....	....	....	65.0	67.8	75.4	78.0	75.4	72.3	59.6	51.6	58.8	....
Decatur	....	....	....	....	66.0	75.1	80.0	76.0	69.5	57.8	49.4	....	....
Elkmont	[44.0]	43.0	50.5	61.2	66.5	73.1	77.8	74.9	68.9	58.7	48.0	58.6	[60.4]
Eufaula	....	....	....	....	70.5	76.8	80.0	77.2	74.4	61.9	57.2	....	....
Evergreen	....	....	....	....	....	77.7	82.0	78.9	75.0	62.9	53.4	....	....
Fayette C. H	....	....	....	....	....	74.4	78.0	74.0	70.7	57.0	48.0	56.5	....
Florence	40.0	43.0	50.6	57.5	64.4	....	....	....	....	....	....	....	....
Fort Deposit	....	....	....	....	71.2	77.4	81.8	78.2	75.0	64.4	54.6	....	....
Gadsden	42.5	42.9	51.7	62.0	68.7	....	....	....	....	58.1	51.0	56.9	....
Greensborough	47.1	47.8	55.5	66.0	70.7	76.9	81.7	77.9	74.8	64.7	53.0	60.3	64.7
Livingston (1)	....	....	....	....	71.4	76.1	79.4	77.4	76.6	62.8	52.4	....	....
Livingston (2)	46.4	47.4	55.0	63.7	69.2	75.6	79.5	*h*79.9	*h*71.4	60.6	50.8	57.4	63.1
Marion	....	....	....	....	68.3	74.6	77.4	75.2	71.6	60.9	51.6	....	....
Mobile	51.3	50.9	58.6	67.6	70.5	77.4	81.3	79.3	76.7	66.0	56.4	61.0	66.4
Montgomery	48.4	48.2	57.0	66.7	71.6	78.2	81.9	78.5	75.4	63.8	54.6	59.1	65.3
Motes	44.6	45.2	53.6	65.2	68.7	75.0	79.4	77.4	75.0	[57.5]	[49.0]	[54.0]	[62.0]
Mount Vernon Barracks	50.5	50.0	58.5	66.8	71.0	77.7	81.0	79.0	*d*75.2	65.6	55.2	60.0	65.9
Mount Willing	....	....	56.7	63.8	69.8	....	79.5	....	74.0	63.4	....	....	....
New Market	41.6	40.6	50.8	58.8	65.1	72.0	75.7	....	....	....	....	....	....
Opelika	....	....	....	....	71.4	77.0	81.0	76.8	*d*72.8	*f*64.2	56.2	....	....
Pine Apple	....	....	....	....	70.7	77.8	81.4	76.7	72.6	61.4	52.9	....	....

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Alabama—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Selma	....	....	....	....	71.4	79.1	82.6	79.7	76.4	63.2	56.0	....	....
Talladega	47.0	47.1	56.0	63.0	70.6	74.1	82.5	....	....	....	....	....	....
Troy	50.1	....	....	g68.5	72.8	....	....	....	....	....	....	....	....
Tuscaloosa	50.4	50.6	59.3	68.7	72.5	78.5	80.6	79.5	76.0	....	....	....	....
Tuscumbia (1)	....	....	....	....	65.8	70.3	78.8	75.6	69.4	57.3	49.6	....	....
Tuscumbia (2)	42.8	41.1	49.7	62.2	66.9	72.8	77.6	74.1	68.2	57.0	49.2	59.6	60.1
Union Springs	47.0	48.2	56.0	64.0	79.0	85.0	80.8	78.0	73.0	[62.0]	52.2	[57.5]	[65.2]
Uniontown	49.3	49.2	58.4	67.5	72.9	78.7	80.9	79.1	75.8	65.4	54.4	60.8	66.0
Valley Head	40.0	39.2	48.0	57.9	62.5	70.2	75.5	71.2	66.2	53.8	46.4	52.5	57.0
Wiggins	....	....	54.2	65.2	70.9	78.6	82.8	81.0	80.4	....	....	57.7	....
Alaska:													
Killisnoo	35.9	31.5	38.4	39.8	47.2	53.7	58.5	52.9	47.3	41.8	37.1	29.7	42.8
Arizona:													
Benson	45.3	48.4	61.1	70.3	77.6	86.0	87.5	87.6	76.7	65.8	54.5	50.2	67.6
Casa Grande	51.0	55.5	66.5	74.2	79.1	89.6	93.0	93.7	84.7	76.7	69.6	65.9	75.0
Eagle Pass	36.0	44.2	....	....	h69.2	....	77.0	72.3	k70.7	....	40.8	44.3	....
Flagstaff	....	....	....	....	62.0	64.3	68.6	66.5	57.5	46.4	35.6	37.2	....
Florence	47.6	51.6	60.4	69.6	75.0	83.2	89.8	88.4	77.1	68.6	57.7	54.6	68.6
Fort Apache (1)	j31.1	36.6	46.5	54.9	61.5	70.3	76.2	74.1	65.0	56.3	42.4	45.0	55.0
Fort Apache (2)	35.6	38.1	46.8	55.8	62.8	71.2	76.3	75.0	66.0	58.0	43.2	46.3	56.3
Fort Bowie (1)	38.1	43.7	50.8	64.1	70.5	78.0	79.6	79.6	67.6	62.7	48.9	51.8	61.3
Fort Bowie (2)	38.1	42.6	50.4	64.2	70.2	77.4	79.1	79.7	67.1	62.9	49.8	52.3	61.2
Fort Huachuca	38.3	42.9	51.5	63.4	69.6	74.6	76.0	76.9	68.2	62.0	50.2	51.4	60.4
Fort Lowell	d40.9	[44.0]	58.6	66.2	71.5	81.2	86.6	86.4	76.3	68.8	56.2	56.6	[66.1]
Fort McDowell (1)	46.2	51.8	59.4	67.8	74.8	84.8	91.6	93.0	81.4	70.4	56.4	55.8	69.4
Fort McDowell (2)	47.3	51.9	59.7	68.1	75.9	85.2	92.0	92.8	81.4	70.3	56.2	54.9	69.6
Fort Mojave	46.6	52.0	62.8	69.1	78.2	87.8	94.9	93.8	82.7	71.0	55.9	52.5	70.6
Fort Verde (1)	38.5	42.4	51.7	60.6	67.2	75.7	82.6	83.4	71.8	61.0	47.0	48.8	60.9
Fort Verde (2)	38.5	42.5	52.2	60.8	69.2	76.3	83.3	84.2	73.6	63.1	47.7	48.6	61.7
Gila Bend	....	....	....	....	....	....	95.1	96.1	83.6	72.3	58.7	57.8	....
Holbrook	31.7	36.4	47.8	59.5	65.4	73.0	77.3	79.2	69.6	60.4	39.5	45.0	57.1
Lochiel	....	....	....	....	....	....	84.0	76.9	65.6	60.3	47.5	50.0	....
Maricopa	51.2	56.0	65.5	73.9	78.2	88.8	93.7	92.8	68.6	71.5	60.2	56.8	71.0

Mount Huachuca	*32.2*	*41.4*	*51.3*	*60.8*	....	....	....	*80.8*	*69.6*	*65.2*	*52.9*	*54.8*	....
New River	....	....	....	*57.8*	*59.2*	*70.7*	....	*90.4*	*78.2*	*68.5*	....	....	....
Pantano	40.2	42.3	56.2	68.5	76.3	83.1	86.6	87.2	70.5	65.0	55.2	53.8	65.4
Peoria	47.0	51.6	60.1	69.2	76.5	84.8	91.9	92.6	82.0	70.2	55.6	54.0	69.6
Phœnix	[47.0]	[51.0]	60.1	70.0	78.6	86.3	92.6	91.6	80.4	70.9	57.0	56.1	[70.1]
San Carlos	42.0	45.8	54.0	65.5	72.1	82.4	87.2	83.8	71.9	63.3	49.0	49.4	63.9
San Simon	44.5	47.0	50.5	63.7	75.0	79.8	81.8	81.5	74.7	....	....	57.1	....
Signal	....	....	....	....	....	*e*84.0	93.0	91.8	80.6	69.4	55.8	52.8	....
Texas Hill	44.6	57.2	68.0	80.6	82.8	91.4	99.2	101.1	86.2	75.4	56.6	54.7	74.8
Tombstone	....	49.4	....	....	65.4	77.4	78.6	77.9	....	....	51.0	....	....
Tucson (1)	*i*52.6	*j*55.0	*h*63.3	*m*69.0	*j*72.5	....	....	....	*d*77.7	68.9	56.2	55.2	....
Tucson (2)	57.4	54.7	60.9	67.7	70.3	73.5	73.8	93.5	80.4	76.1	55.1	50.7	67.8
Volunteer Springs	....	....	....	....	52.1	59.5	67.6	68.8	....	....	....	....	....
Whipple Barracks	28.4	31.2	44.0	53.4	59.2	66.6	74.6	73.4	63.6	54.4	42.8	42.2	53.1
Wilcox (1)	45.8	50.3	55.6	67.8	73.0	80.8	82.9	83.4	73.5	66.7	55.3	[51.0]	[65.5]
Wilcox (2)	40.1	43.5	51.2	60.2	67.0	75.4	79.7	79.4	67.8	60.6	46.4	49.2	60.0
Williams	24.6	19.1	38.4	47.8	52.2	61.4	67.5	63.8	50.2	51.2	32.3	[47.0]	[46.3]
Winslow	[29.0]	[35.0]	44.4	53.6	[65.0]	80.8	78.4	75.6	70.6	61.8	41.2	39.9	[56.3]
Yuma (1)	52.1	57.5	66.4	[73.5]	[77.6]	89.3	94.2	94.3	84.2	73.7	61.0	58.0	[73.5]
Yuma (2)	53.4	58.8	65.6	73.5	77.6	85.6	92.0	92.6	83.8	72.6	62.0	58.2	73.0
Arkansas:													
Alexander	39.6	39.9	49.8	63.3	67.0	....	....	....	....	....	....	....	....
Brinkley	....	....	....	....	70.0	73.1	78.8	....	*d*66.9	....	....	....	....
Camden	[45.0]	46.4	54.8	66.1	[68.0]	[76.5]	79.5	79.0	72.0	64.3	48.0	61.2	[63.4]
Conway	41.3	42.4	53.8	64.6	66.7	73.1	79.3	75.3	69.5	58.1	45.7	57.0	60.6
Dallas	36.8	43.0	52.3	62.1	61.9	69.8	....	80.4	....	....	48.2	....	....
Dayton	42.7	42.4	53.4	64.1	68.3	73.3	80.6	77.2	[70.5]	[62.5]	51.5	[58.0]	[62.0]
Devall's Bluff	....	....	....	....	68.1	75.5	81.7	74.0	69.4	56.8	47.4	53.1	....
El Dorado	41.6	43.9	51.2	[65.5]	66.4	72.4	76.6	74.7	69.4	59.9	46.2	57.0	[60.4]
Eureka Springs	39.2	38.2	....	....	....	73.1	78.0	....	....	....	....	....	....
Forrest City	45.6	47.0	56.2	67.7	69.6	75.0	79.2	75.5	70.3	63.6	50.1	61.6	63.4
Fort Smith	41.1	42.4	53.2	65.7	68.0	73.6	81.2	77.9	70.2	62.6	46.0	57.8	61.6
Heber	39.3	44.9	50.4	61.7	61.9	71.7	78.5	73.6	[69.0]	56.7	44.5	56.1	[59.0]
Helena (2)	42.3	43.9	53.7	65.7	69.8	74.5	81.4	77.1	70.8	60.3	48.8	[60.5]	[62.4]
Hot Springs	[44.0]	43.2	53.6	64.5	66.0	72.6	78.7	75.5	74.7	66.2	50.9	60.0	[62.5]
Lead Hill	38.1	36.7	50.1	63.1	67.9	74.9	82.5	77.1	68.2	59.2	44.1	55.3	59.8
Little Rock	43.6	43.4	54.3	64.4	67.8	73.6	80.4	76.8	70.8	60.8	47.0	59.1	61.8
Little Rock Barracks	43.4	43.6	54.3	64.0	67.7	73.6	80.5	77.6	72.2	61.3	47.9	59.3	62.1
Lonoke	46.2	46.1	56.3	66.6	69.9	75.2	82.2	78.2	73.2	63.1	50.1	60.2	63.9
Malvern	....	....	....	....	....	*e*76.6	82.3	77.3	....	63.6	63.5	68.0	....
Monticello	....	....	....	....	....	77.0	82.4	78.2	74.0	64.3	50.2	57.4	....

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Arkansas—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Newport (2)	....	....	....	62.1	67.1	73.8	80.2	75.8	69.3	57.6	46.4	....	....
Osceola	[41.5]	[42.0]	51.4	61.7	77.2	70.4	79.8	73.7	67.1	55.4	45.2	56.6	[60.2]
Ozone	38.7	39.2	49.8	61.7	65.2	70.9	76.4	73.8	65.8	55.8	42.5	55.4	57.9
Pine Bluff	....	....	....	....	....	76.8	82.2	78.6	72.8	62.6	49.6	60.4	....
Prescott	....	....	....	....	d70.2	e74.8	80.4	77.6	71.3	62.4	48.5	....	....
Russellville	[42.0]	41.6	53.3	69.6	68.2	74.6	81.8	77.0	70.8	62.4	48.5	[59.0]	[62.4]
Stuttgart	42.7	42.1	52.8	63.4	66.7	73.4	79.7	75.8	70.2	58.8	46.8	58.8	60.9
Texarkana	44.8	49.9	54.4	63.4	70.9	77.4	82.3	80.2	74.8	66.8	51.6	62.8	64.9
Washington	44.2	45.9	55.3	66.1	74.6	74.0	79.8	77.2	71.9	65.1	48.4	60.7	63.6
Winslow	....	....	....	....	....	....	76.9	72.9	65.0	57.8	41.1	53.0	....
California:													
Alcade	43.7	48.4	58.1	67.4	71.8	84.2	86.7	85.7	80.5	64.9	53.8	51.8	66.4
Alcatraz Island	49.3	52.4	55.6	57.2	56.2	57.4	55.5	56.5	59.9	60.1	57.5	50.1	55.6
Almaden	50.5	53.1	63.6	62.7	65.3	70.0	71.0	72.2	71.3	63.5	55.6	50.1	62.4
American Hill	....	....	....	....	....	71.4	70.2	71.8	67.0	57.1	51.7	44.2	....
Anaheim	57.8	61.3	58.8	65.5	67.8	69.4	73.0	77.9	76.2	65.4	61.8	59.0	66.2
Anderson	47.8	53.6	58.6	62.2	68.0	82.7	87.0	82.7	76.2	61.6	54.1	43.8	64.9
Angel Island	55.4	57.0	58.0	59.8	59.9	62.2	61.5	61.4	65.0	61.3	58.5	49.2	59.1
Antioch	43.6	48.6	54.9	60.4	67.4	73.9	77.1	[74.0]	[72.0]	62.8	54.6	50.5	[61.6]
Aptos	48.6	51.6	56.6	59.7	59.6	62.5	63.4	61.9	62.9	60.7	56.8	52.3	58.0
Athlone	45.9	50.9	61.0	67.1	72.6	72.7	83.3	82.6	77.9	65.9	56.5	52.1	65.7
Auburn	44.6	49.7	55.6	59.3	63.8	80.1	76.5	76.4	71.9	61.7	54.4	47.0	61.8
Bakersfield	46.0	52.6	63.0	70.0	78.7	88.3	88.6	86.5	79.3	67.0	57.3	53.6	69.2
Barstow	42.5	49.6	57.4	65.6	71.6	81.4	87.5	85.6	75.8	64.4	52.5	49.9	65.3
Beaumont	47.9	51.4	56.2	64 0	66.6	72.0	86.4	83.1	77.3	65.5	57.3	48.5	64.7
Belmont	....	....	....	....	....	....	....	....	69.5	62.4	57.1	49.8	....
Benicia Barracks	45.6	51.5	56.5	59.0	61.5	66.7	67.9	70.0	70.2	61.4	54.9	47.8	59.4
Berendo	[45.0]	[50.5]	60.9	66.6	74.7	88.2	84.6	82.6	77.9	67.6	56.3	51.4	[66.8]
Berkeley	47.4	51.4	54.1	55.9	57.3	59.3	58.5	59.7	62.5	59.8	56.2	48.4	55.9
Bishop Creek	37.3	47.3	55.9	68.2	76.1	88.8	93.2	87.6	76.7	[52.0]	[47.0]	40.6	[64.2]
Boca	[32.0]	31.3	33.6	48.2	48.6	63.9	63.9	61.9	[60.0]	43.5	41.7	28.8	[46.4]
Borden	45.1	49.4	58.0	63.7	69.3	80.0	82.6	81.6	74.8	62.8	56.0	50.9	64.5
Boulder Creek	44.7	46.7	50.5	60.8	61.0	67.5	69.4	67.8	65.7	54.2	50.2	50.1	57.4

Brentwood	*45.3*	*52.9*	*62.8*	*67.2*	*72.3*	*77.5*	*79.6*	*79.5*	*72.6*	*68.3*	60.6	51.2	65.8
Brighton	*46.2*	*51.1*	*60.2*	*64.6*	*68.4*	*75.8*	*77.6*	*77.2*	*75.2*	65.0	59.2	51.9	64.4
Byron	*46.2*	*50.9*	*59.8*	*66.7*	*71.1*	*78.6*	*81.6*	*79.7*	*75.9*	63.6	55.4	50.2	65.0
Cactus	*61.3*	*63.4*	*71.7*	*78.3*	*81.7*	*91.8*	*99.5*	*97.4*	*91.3*	79.4	71.5	63.0	79.2
Caliente	*47.8*	*49.6*	*58.5*	*66.7*	*70.7*	*82.7*	*90.2*	*85.9*	*73.7*	67.9	58.3	53.0	67.1
Calistoga	46.0	51.5	55.3	60.1	63.0	66.9	67.5	68.6	67.0	57.9	54.4	47.5	58.8
Campo	[33.0]	35.5	44.4	42.5	53.2	65.4	71.9	82.6	68.5	54.4	53.4	52.8	[54.8]
Castroville	48.5	50.6	55.1	57.9	58.7	61.2	60.5	61.2	63.5	60.7	57.6	51.3	57.2
Cedarville	......	......	......	......	54.7	67.8	73.6	74.2	64.4	......	......	......	......
Centreville	50.8	54.4	58.8	62.2	65.5	68.9	69.5	70.5	71.6	65.5	45.4	53.0	61.3
Chico	45.3	51.4	58.9	64.2	69.7	82.6	85.2	85.1	77.9	64.2	54.7	48.1	65.6
Chino	49.7	55.5	61.2	64.0	64.9	68.8	74.7	78.1	73.6	64.3	56.9	53.2	63.7
Cisco	31.6	37.4	38.1	44.3	48.7	63.4	64.3	63.7	59.4	45.6	41.0	31.3	47.4
Coles	34.0	40.1	47.2	53.2	57.3	68.7	......	......	......	......	......	......	......
Colfax	43.2	47.4	51.0	54.8	60.5	75.1	77.3	76.4	72.6	57.1	51.8	41.6	59.1
Colton	48.4	57.4	60.2	67.1	66.0	72.3	82.3	80.3	76.0	67.0	58.1	58.2	66.1
Corning	44.8	46.1	55.1	63.4	71.2	84.6	88.2	82.0	77.6	61.0	55.9	47.6	64.8
Davisville	46.1	52.5	58.5	64.5	69.6	71.6	70.9	80.5	76.5	64.3	56.5	51.7	63.6
Delano	46.4	51.8	61.6	68.6	71.8	86.8	88.2	87.3	82.3	66.9	56.7	53.0	68.4
Delta	44.3	51.2	55.5	59.1	64.8	77.1	77.8	75.5	70.8	58.8	52.5	42.1	60.8
Downey	51.0	54.3	60.5	65.6	66.6	69.3	71.8	71.3	72.4	65.8	61.5	59.0	64.1
Dunnigan	43.4	50.3	61.8	64.5	68.6	76.2	78.4	77.8	74.8	64.0	55.0	49.7	63.7
Dunsmuir	41.0	47.4	49.4	51.3	53.2	67.6	70.8	69.5	62.6	56.9	47.0	38.7	54.6
Edgwood	33.1	36.9	45.7	50.7	54.7	67.5	71.7	66.0	59.9	51.8	51.1	[42.5]	[52.6]
El Dorado	43.8	48.5	57.0	62.3	68.2	80.5	83.1	80.5	71.1	61.5	57.1	47.9	63.5
Elmira	49.0	55.0	63.3	66.9	71.6	73.1	76.5	76.5	75.1	64.1	58.2	50.3	65.0
El Verano	47.8	50.6	57.2	61.8	61.4	64.4	65.7	66.6	67.0	59.9	55.1	47.8	58.8
Emigrant Gap	35.7	40.6	41.0	46.4	49.2	63.9	65.9	66.5	64.4	48.1	43.7	31.1	49.7
Esperanza	40.2	44.4	55.6	63.9	70.1	80.8	80.9	78.9	78.8	61.5	53.2	48.8	63.1
Eureka	46.9	48.2	52.2	53.2	54.8	55.0	55.6	55.4	56.0	56.2	53.2	46.6	52.8
Farmington	44.7	49.1	57.0	64.5	67.4	76.6	78.7	78.8	74.9	64.2	54.5	51.6	63.5
Felton	47.5	51.3	57.9	62.5	60.0	68.0	67.2	65.8	65.8	59.6	54.9	52.0	59.4
Florence	55.0	57.5	61.1	64.3	64.2	68.9	71.6	71.2	72.5	65.4	57.5	58.7	64.0
Folsom	44.7	50.6	60.6	66.3	69.1	77.6	51.5	81.0	76.8	63.0	57.0	48.7	62.2
Fort Bidwell	25.8	35.7	45.1	51.4	55.7	68.3	72.1	71.0	60.7	50.3	38.9	27.8	50.2
Fort Gaston	37.2	41.5	50.0	53.6	56.2	67.4	69.8	65.8	60.5	55.6	46.6	42.2	53.9
Fort Mason	46.6	52.0	56.1	57.9	58.3	60.1	58.0	58.7	56.8	60.3	52.3	50.7	55.6
Fresno (1)	43.8	50.2	58.4	63.5	69.6	79.5	82.6	82.2	75.6	62.8	54.1	49.1	64.3
Fresno (2)	51.1	65.1	62.5	69.1	72.9	86.3	90.8	85.8	84.6	69.0	61.1	53.3	71.0
Fruto	47.3	52.0	58.6	64.0	70.3	84.7	84.5	84.5	82.9	63.5	58.2	48.9	66.6
Galt	44.8	50.7	58.0	64.5	66.8	75.3	77.5	77.0	72.2	62.4	50.6	51.1	62.6

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
California—Continued.													
Georgetown	43.2	[45.0]	[51.0]	54.8	58.6	69.2	75.5	74.9	71.0	56.3	51.6	39.8	[57.6]
Gilroy	46.0	49.5	56.7	d61.3	63.7	67.1	68.6	69.1	67.8	61.1	54.8	48.7	59.5
Girard	41.8	49.3	52.0	55.8	63.5	75.9	79.7	77.2	69.2	60.3	50.5	42.7	59.8
Glen Ellen	46.3	48.7	55.1	58.9	62.4	64.6	67.7	67.7	66.1	59.6	55.0	48.1	58.4
Goshen	44.6	53.2	56.0	68.7	76.9	90.7	88.9	83.5	75.7	66.7	53.3	48.3	67.2
Hanford	43.0	48.0	58.8	64.6	......	......	......	......	......	......	......	......	......
Hollister	47.6	48.1	58.7	64.0	65.1	61.7	68.8	68.5	69.6	61.4	57.0	56.1	60.6
Hornbrook	33.2	40.3	48.6	56.3	63.4	75.8	79.9	74.4	66.0	54.7	44.1	35.9	56.0
Hydesville	44.4	47.2	52.5	[53.5]	56.6	57.8	58.9	58.4	58.6	56.2	52.6	44.0	[53.4]
Indio	[51.0]	56.8	63.1	74.2	79.5	88.7	96.4	97.4	88.0	75.7	61.5	58.9	[74.3]
Ione	46.6	46.4	54.0	62.8	67.9	73.9	77.2	75.3	72.2	62.6	49.5	49.1	61.5
Iowa Hill	43.9	49.1	52.1	56.3	60.4	74.3	77.3	76.8	72.1	57.9	40.0	41.1	58.4
Julian	......	......	......	......	......	......	78.2	81.8	66.7	63.5	51.8	44.6	......
Keeler (1)	39.0	46.9	53.6	62.4	68.8	78.9	83.8	82.7	74.9	61.6	50.2	44.8	62.3
Keeler (2)	40.3	47.9	54.6	63.2	69.9	80.1	83.2	80.6	73.8	61.5	49.9	49.3	62.9
Keene	41.6	45.0	53.1	55.9	62.6	76.5	79.3	76.0	71.5	60.5	53.4	44.8	60.0
King City	46.0	48.4	52.6	54.2	63.4	62.7	62.0	65.4	72.0	55.7	52.7	48.6	57.0
Kingsburgh	42.8	49.7	61.4	68.2	75.7	85.8	87.9	82.7	77.8	65.4	53.9	51.0	66.9
Knight's Landing	43.9	47.0	55.0	62.6	64.1	68.3	71.2	78.4	76.1	63.6	60.2	51.7	61.8
La Grange	45.6	50.8	60.3	62.9	68.5	79.6	81.5	83.5	76.0	64.4	54.9	50.1	64.8
Lathrop	44.1	51.5	56.4	60.3	63.7	69.2	75.8	72.0	71.6	63.3	56.0	51.9	61.3
Laurel	48.1	51.7	55.5	60.2	61.9	66.1	70.1	68.6	69.7	61.1	59.7	49.1	60.2
Lemoore	41.7	56.2	62.5	67.8	74.9	84.4	85.9	83.6	75.1	66.8	59.7	53.8	67.7
Lewis Creek	45.3	51.6	60.2	66.9	73.5	84.0	88.0	86.7	80.0	66.0	55.9	49.5	67.3
Livermore	45.6	52.8	57.2	59.0	62.3	64.9	66.8	67.8	68.0	62.4	53.8	46.9	59.0
Livingston	46.6	52.3	59.6	63.9	71.2	j80.2	82.1	82.5	76.5	61.5	55.1	52.0	65.3
Lodi	45.6	50.6	58.0	62.1	65.0	71.4	73.8	74.4	72.5	62.4	54.3	49.0	61.6
Long Beach	52.4	55.5	59.9	66.2	63.4	68.3	72.2	71.8	73.1	67.5	59.1	59.7	64.1
Los Angeles (1)	52.4	56.4	59.2	62.2	62.6	66.4	70.8	71.6	72.6	66.3	61.3	54.8	63.0
Los Angeles (2)	49.9	53.9	58.4	63.5	64.5	69.2	72.0	73.5	72.5	66.1	59.3	54.8	63.1
Los Banos	43.1	50.2	59.8	66.1	69.0	76.9	81.8	82.3	[73.0]	64.8	55.6	50.4	[64.4]
Los Gatos	47.7	51.0	57.5	63.4	66.8	71.1	72.3	70.6	72.1	63.5	59.0	52.3	62.3
Mammoth Tank	51.2	56.5	67.1	79.3	84.2	90.3	100.2	98.8	88.6	77.4	63.0	57.0	76.1

Martinez	45.8	51.0	54.8	59.6	64.2	[70.0]	70.3	70.0	68.4	60.7	55.8	49.0	[60.0]
Marysville	53.1	53.1	65.1	69.5	75.6	82.1	86.1	78.8	82.6	65.9	59.0	50.5	68.4
Menlo Park	47.5	51.2	56.3	59.1	61.9	66.4	66.0	67.9	66.3	61.3	55.8	50.3	59.2
Merced	45.0	48.8	57.6	63.3	69.6	78.2	81.3	81.5	75.3	63.2	56.3	51.5	64.3
Modesto	45.0	50.2	61.4	69.6	73.8	75.2	78.4	81.1	77.0	63.2	57.0	50.9	65.2
Mojave	49.9	54.9	58.1	61.0	68.1	82.7	89.1	86.5	80.5	66.3	59.1	49.0	67.1
Montague	33.7	43.9	53.8	62.0	65.1	82.9	86.3	86.4	75.5	58.8	46.6	37.2	61.0
Monterey	49.8	50.1	56.1	60.0	61.7	64.7	64.5	64.4	65.0	64.4	54.3	50.9	58.8
Monterey (Hotel Del Monte)	[50.0]	53.3	58.7	60.6	60.0	65.5	67.2	62.5	62.6	61.6	57.8	53.0	[59.4]
Mount Hamilton	39.5	43.9	44.8	50.3	52.8	67.4	70.7	70.4	66.9	50.5	48.5	35.2	53.4
Napa City (1)	41.6	46.4	53.2	57.2	58.4	62.9	63.0	63.3	64.4	57.7	52.0	44.8	55.4
Napa City (2)	44.9	52.3	54.7	59.8	62.5	68.3	67.0	65.9	63.4	58.8	54.9	51.2	58.6
National City	......	......	......	......	......	......	70.0	72.3	69.9	64.5	61.5	55.9	......
Needles	49.6	54.7	......	......	......	......	98.8	97.0	......	72.1	59.5	56.5	......
Newark	48.8	[51.0]	[56.0]	61.6	[62.0]	68.9	66.8	68.6	69.8	63.5	56.8	51.6	[60.4]
Newhall	48.0	[56.0]	55.0	61.1	63.4	67.7	77.2	79.2	71.9	[66.0]	56.4	49.9	[62.6]
Newman	48.3	48.4	62.5	62.4	69.0	80.1	79.9	82.7	73.5	61.5	57.6	47.9	64.5
Niles	50.4	54.3	58.5	63.2	65.5	68.7	68.3	68.0	68.1	63.5	61.2	55.4	62.1
Norwalk	48.2	53.6	61.4	67.1	68.1	69.8	73.3	73.5	73.4	65.4	59.4	55.4	64.0
Oakland (1)	47.7	51.4	56.9	59.0	59.0	61.3	59.8	61.0	63.2	61.1	57.0	49.9	57.3
Oakland (2)	47.7	49.7	56.2	59.6	60.0	61.9	62.0	61.1	63.1	61.1	56.2	51.7	57.5
Ontario	[52.0]	55.1	58.9	69.6	71.6	69.8	80.8	83.3	83.6	69.7	[58.0]	52.1	[67.0]
Orland	48.9	55.6	62.4	70.0	76.1	86.1	86.7	84.5	80.3	64.2	59.0	47.9	68.5
Oroville	47.0	52.0	59.0	63.1	68.5	79.0	80.0	79.4	74.8	64.1	57.2	49.3	64.4
Pajaro	49.0	51.7	56.1	60.2	60.2	62.6	62.5	63.3	64.4	59.9	56.8	51.5	58.2
Paso Robles	41.6	46.1	54.3	68.6	61.8	67.4	73.1	71.5	67.9	59.2	[52.0]	47.5	[59.2]
Petaluma	46.6	50.1	56.4	59.4	61.3	65.3	65.2	66.1	66.4	61.1	55.5	49.3	58.6
Placerville	41.3	45.6	53.6	58.8	66.1	76.2	79.1	74.5	68.0	58.9	50.4	45.1	59.8
Pleasanton	47.1	51.0	56.8	60.4	63.2	68.5	74.6	74.8	71.7	62.7	[56.0]	47.9	[61.2]
Point Reyes Light	[45.0]	[50.0]	54.1	54.2	53.9	55.4	54.0	54.6	[61.0]	55.6	56.8	49.8	[53.7]
Pomona	57.3	60.6	62.2	68.7	69.8	72.0	79.2	78.4	76.5	71.0	63.7	58.1	68.1
Portersville	44.6	50.1	60.7	67.7	75.0	87.9	89.0	89.9	81.8	68.7	55.3	55.3	68.8
Presidio of San Francisco	50.2	50.4	55.4	56.2	55.7	56.8	55.8	56.8	60.0	58.9	57.0	50.7	55.3
Puente	49.5	53.9	58.5	63.0	65.9	69.9	75.2	74.9	74.8	66.4	57.5	54.7	63.7
Red Bluff (1)	45.0	50.8	56.8	61.2	67.0	79.7	81.2	79.9	76.0	61.4	54.4	44.8	63.2
Red Bluff (2)	46.9	53.8	57.5	62.2	68.0	82.4	85.2	81.1	76.9	63.2	57.3	50.9	65.4
Redding	45.5	53.3	57.8	63.5	69.5	81.7	83.9	82.0	76.1	58.8	54.3	43.6	64.2
Riverside	48.2	51.9	56.5	62.3	64.0	69.6	76.0	76.1	71.2	61.6	55.5	51.6	62.0
Rocklin	43.6	49.8	57.6	62.9	70.1	78.1	81.4	80.8	75.7	65.0	55.6	49.2	64.2
Rumsey	47.4	48.9	54.1	62.8	70.3	82.0	82.9	82.9	79.4	62.3	54.3	47.6	64.6
Sacramento (1)	40.2	44.9	54.5	58.6	61.4	67.8	68.3	67.1	63.4	55.6	47.6	44.1	56.1

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
California—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Sacramento (2)	43.7	48.1	56.6	62.4	65.9	73.1	74.1	73.6	70.3	61.4	54.2	49.1	61.0
Sacramento (3)	44.7	50.2	57.4	61.2	64.2	70.1	72.8	74.0	71.9	61.7	54.2	48.5	60.9
Salinas (1)	44.9	[49.5]	55.1	56.9	57.0	60.4	57.1	58.6	60.2	58.9	54.4	49.3	[55.2]
Salinas (2)	44.0	47.8	53.9	57.8	59.0	60.1	60.3	60.0	65.0	58.4	53.6	51.2	55.9
Salton	[50.0]	[55.0]	67.8	79.8	79.2	92.5	95.3	95.6	86.9	74.2	61.9	57.5	[74.6]
San Ardo	46.4	48.9	57.4	60.6	62.6	67.6	68.3	69.6	69.0	61.3	54.5	49.7	59.7
San Bernardino	52.8	57.5	59.8	62.0	63.5	......	......	......	......	......	......	......	......
San Diego (1)	52.9	56.0	59.4	61.8	62.2	64.9	69.0	72.0	70.8	65.8	61.4	57.1	62.8
San Diego (2)	54.8	58.0	59.2	60.4	60.8	64.0	67.6	70.8	70.2	65.4	62.0	57.4	62.6
San Fernando	48.5	55.2	57.4	64.8	63.2	67.9	76.9	80.6	73.5	63.9	59.5	50.8	63.5
San Francisco	50.4	54.0	57.2	58.8	58.8	60.2	58.8	60.4	64.6	61.8	58.6	51.3	57.9
San Gabriel	52.6	54.2	62.6	66.6	67.2	71.1	75.7	76.7	74.3	69.4	61.1	55.3	65.6
Sanger Junction	45.2	51.1	61.7	68.0	75.8	86.4	89.4	86.3	78.4	66.3	56.4	47.1	67.7
San José	47.6	50.9	56.7	59.7	61.9	66.2	66.1	67.2	67.7	61.5	56.3	50.5	59.4
San Luis Obispo	51.9	55.2	58.0	60.0	59.9	64.2	64.4	......	......	......	......	......	......
San Mateo	45.5	49.1	54.4	58.6	59.7	63.9	60.6	72.0	64.8	57.4	54.9	49.3	57.5
San Miguel	45.6	49.6	55.4	59.6	63.6	68.5	72.9	73.5	70.4	61.7	52.2	52.3	60.4
San Pedro	53.5	57.5	63.7	65.8	66.7	70.6	74.6	74.6	75.6	68.4	[61.0]	57.1	[65.8]
Santa Aña	55.7	58.5	61.3	66.3	67.7	72.1	73.7	73.7	73.8	66.7	59.5	57.2	65.5
Santa Barbara (1)	53.0	55.4	59.0	59.9	60.0	62.5	62.2	67.3	68.8	63.9	59.6	54.2	60.5
Santa Barbara (2)	51.9	56.8	60.0	64.8	63.6	66.9	69.7	70.5	73.2	67.0	61.9	56.0	63.5
Santa Clara	49.1	52.8	57.5	59.8	61.9	66.3	64.6	66.3	66.9	61.4	56.4	50.8	59.5
Santa Cruz	50.9	52.9	56.3	59.7	59.3	63.6	67.1	65.2	67.5	61.9	[57.0]	55.0	[59.7]
Santa Margarita	[45.0]	51.8	54.6	62.5	64.2	71.9	76.9	72.3	71.8	60.4	50.1	47.9	[60.8]
Santa Maria	48.7	51.8	[56.0]	61.8	60.0	67.0	64.9	65.6	66.8	63.3	58.3	52.2	[59.7]
Santa Monica	50.7	52.5	58.0	63.1	65.8	68.9	70.8	70.0	72.8	67.6	60.5	55.0	63.0
Santa Paula	56.2	57.7	62.0	66.8	68.4	68.4	72.9	71.8	73.2	67.2	63.0	57.3	65.4
Santa Rosa	46.8	48.6	51.8	58.5	62.6	65.4	65.2	64.7	65.3	60.3	55.8	50.0	57.9
Selma	42.7	49.0	56.9	63.9	73.1	[79.0]	85.7	83.6	80.0	66.0	53.9	49.8	[65.3]
Seven Palms	55.6	60.1	67.1	79.6	83.7	93.0	98.6	97.9	87.4	78.3	66.0	59.2	77.2
Shingle Springs	[45.0]	[46.0]	56.4	54.6	63.0	74.6	79.5	80.6	76.4	65.2	52.2	48.9	[61.9]
Sims	38.4	41.9	45.2	56.8	63.1	76.7	72.1	70.1	64.8	54.7	46.6	39.2	55.8
Sisson	34.8	38.4	44.4	51.9	55.5	68.8	71.3	69.5	58.5	47.3	42.0	32.5	51.2

Soledad	*44.2*	*48.1*	*53.2*	*58.0*	*61.3*	*63.0*	*62.9*	*61.8*	*63.1*	58.9	[53.0]	47.8	[56.3]
Sonoma	*o46.3*	*f50.5*	......	......	......	......	......	......	......	61.5	56.9	......	......
Soquel	48.5	51.9	55.9	60.4	65.8	68.2	64.2	66.2	65.8	63.6	59.2	55.0	60.4
South Side	49.6	49.7	52.3	60.6	63.3	69.6	77.1	79.0	74.4	62.7	52.3	46.7	61.4
South Vallejo	48.3	51.0	53.4	57.3	58.6	59.5	58.8	60.0	62.4	58.1	52.3	47.7	55.6
Spadra	44.6	51.9	58.7	62.1	64.0	69.4	72.6	75.6	72.5	64.7	59.1	54.3	62.5
Steeles	49.4	53.0	57.3	52.9	58.3	63.2	61.8	64.9	65.1	62.6	57.6	51.0	58.6
Stockton (2)	45.1	49.2	55.3	60.5	62.9	70.9	[80.0]	73.2	74.7	64.9	62.2	55.6	[62.9]
Suisun City	48.7	51.9	59.8	63.9	66.2	69.3	70.5	72.7	69.6	60.5	57.8	51.1	61.8
Summit	25.3	30.1	34.3	40.4	44.4	61.1	61.6	60.8	56.1	42.1	36.3	28.0	43.4
Susanville	29.7	36.6	46.2	53.6	58.7	74.1	76.5	74.0	62.9	49.0	39.9	32.9	52.8
Sutter Creek	41.8	47.6	53.1	55.7	60.9	67.6	68.9	69.4	62.9	55.7	48.8	43.6	56.3
Tehachapi	35.5	38.5	45.8	55.4	62.3	78.3	82.3	78.3	67.6	55.8	48.0	39.6	57.3
Tehama	50.2	51.7	60.1	65.6	75.6	79.6	85.6	79.7	76.0	60.3	56.5	49.1	65.8
Templeton	44.9	48.3	56.1	61.9	63.1	67.8	72.5	73.3	68.0	60.7	53.3	49.6	60.0
Towles	40.6	46.4	49.0	55.0	60.1	73.9	77.3	75.3	72.8	56.8	50.7	38.2	58.0
Tracy	40.7	38.6	53.3	61.6	70.9	78.6	79.5	81.9	79.1	65.5	49.3	43.2	61.8
Traver	37.8	48.8	57.9	65.4	70.7	85.4	89.0	83.3	75.2	67.8	58.9	51.1	66.0
Tropico	48.9	51.3	55.4	62.6	65.8	67.9	73.4	72.5	72.5	64.5	59.9	5[illegible].7	62.4
Truckee	23.1	31.5	41.1	50.3	54.5	70.5	69.3	69.2	61.1	46.3	39.4	29.7	48.8
Tulare	45.9	52.4	62.7	68.4	74.0	85.3	88.3	86.3	79.1	66.6	57.3	53.1	68.3
Turlock	46.9	51.4	59.6	64.5	71.0	79.6	81.3	82.2	74.0	61.8	56.0	51.9	65.0
Upper Mattole	45.1	51.8	55.6	59.7	58.6	61.1	63.8	65.2	62.9	57.6	54.4	45.4	56.8
Vacaville (1)	46.1	[50.0]	57.0	61.0	64.9	72.5	74.4	75.5	74.5	62.9	56.2	48.6	[62.0]
Vacaville (2)	45.3	50.1	57.6	62.4	67.4	73.8	75.0	73.1	73.5	63.6	56.4	48.1	62.2
Valley Springs	45.0	48.0	58.4	64.8	67.4	78.9	82.5	81.2	76.1	63.6	55.2	49.5	64.2
Vina	45.8	49.1	58.3	63.5	67.8	80.8	81.8	76.9	74.9	60.9	[54.0]	46.9	[63.4]
Volcano Springs	54.2	57.9	66.9	81.8	84.9	92.9	99.8	102.5	89.7	78.5	65.7	62.2	78.1
Walla Walla Creek	32.8	35.9	45.8	48.6	55.0	66.9	70.0	68.8	55.8	51.9	42.6	33.0	50.6
Walnut Creek	54.1	55.3	56.9	60.4	63.4	68.1	70.5	71.5	71.0	62.0	54.7	49.3	61.4
Westley	48.5	51.8	61.0	69.7	73.0	82.0	84.1	81.3	75.6	67.2	58.3	53.7	67.2
Wheatland	44.1	48.9	56.9	60.3	64.8	73.8	75.6	76.1	72.6	60.9	52.9	46.9	61.2
Whittier	54.3	59.8	63.6	65.4	68.1	71.2	78.1	76.7	76.5	68.4	65.9	60.2	67.4
Williams	45.2	48.6	54.5	59.9	70.3	84.8	93.9	88.2	[76.0]	59.1	[54.0]	38.9	[64.4]
Willow (1)	41.8	48.1	56.9	61.6	68.0	78.7	79.4	76.6	74.3	58.6	54.3	45.4	62.0
Willow (2)	42.9	47.6	51.8	59.7	67.9	80.3	82.2	79.7	74.7	60.7	53.0	46.6	62.3
Winters	47.5	53.8	60.3	67.4	73.3	82.6	85.5	84.9	80.2	66.9	56.9	51.2	67.5
Woodland	44.0	46.5	54.0	59.9	65.9	72.1	75.8	71.8	70.9	58.9	53.3	49.0	60.2
Colorado:													
Agate	......	......	43.8	......	53.0	59.2	......	......	......	47.6	28.5	31.3	......
Alma	13.6	15.5	18.2	33.2	36.7	48.8	57.8	52.0	43.0	36.7	[23.0]	[30.0]	[34.0]

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Colorado—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Aspen	13.5	18.7	31.4	41.8	46.6	50.7	59.2	[55.0]	[46.0]	41.0	22.0	29.3	[37.9]
Bennet	......	26.0	35.0	33.1	45.5	66.2	......	......	......	......	33.9	41.5	......
Breckenridge	25.0	19.0	29.0	38.0	41.3	48.6	56.4	56.3	47.0	46.8	27.6	33.8	39.1
Byers	......	......	45.6	52.9	63.6	70.3	......	......	......	50.3	34.6	42.4	......
Cañon City	30.4	35.1	46.4	54.2	60.8	70.0	77.3	75.7	64.3	54.5	33.7	44.4	53.9
Cheyenne Wells	......	......	40.5	50.7	58.8	66.0	......	......	......	54.0	33.4	39.8	......
Climax	7.9	9.6	20.0	31.8	34.5	44.2	54.9	51.8	41.8	34.2	22.4	20.4	31.1
Colorado Springs	25.4	28.1	41.0	49.4	53.8	62.2	69.8	70.8	58.2	50.0	31.8	40.8	48.4
Como (ranch near)	16.0	17.4	28.4	37.0	40.9	49.4	57.6	54.8	46.9	38.4	22.0	22.3	35.9
Coulter	9.4	16.7	31.6	41.4	45.3	52.5	60.4	59.9	47.8	[40.0]	[30.0]	[33.0]	[39.0]
Deer Trail	......	......	39.7	43.8	53.5	63.6	......	......	......	47.0	27.0	34.7	......
Delta	15.4	25.0	*e*41.7	54.1	61.2	69.0	74.7	69.8	56.8	46.6	27.0	33.8	47.9
Denver (1)	27.2	29.6	43.3	51.1	55.5	64.3	72.0	72.8	60.0	51.8	32.4	40.5	50.0
Denver (2)	......	29.9	42.9	51.4	55.8	65.9	......	......	......	51.4	30.9	......	......
Dolly Varden Mine	5.5	5.2	13.4	20.4	25.0	34.4	44.2	42.0	32.9	28.8	[27.0]	[30.0]	[25.7]
First View	......	......	39.8	49.4	......	65.8	......	......	......	52.8	33.1	42.1	......
Fort Collins	21.3	25.3	41.1	49.8	53.5	62.3	68.3	69.3	57.3	44.6	32.1	32.0	46.4
Fort Crawford	21.6	28.0	43.5	52.4	56.6	65.2	72.5	71.0	60.4	51.7	34.7	38.0	49.6
Fort Lewis	17.8	21.4	34.8	47.2	50.1	59.1	65.8	65.7	53.8	47.4	29.6	31.3	43.7
Fort Logan	27.8	29.5	44.5	52.3	55.6	65.8	72.6	73.7	60.5	52.6	30.5	41.0	50.5
Fort Lyon	19.5	28.5	43.3	54.3	60.1	69.0	76.6	77.1	65.4	53.8	[34.0]	[37.0]	[51.6]
Fraser	......	......	......	37.4	43.9	54.8	*e*56.5	*g*61.8	......	35.9	12.6	15.8	......
Georgetown	23.8	27.9	35.2	42.4	45.9	53.9	62.4	62.8	52.0	44.7	29.0	34.5	42.9
Glenwood Springs	18.1	25.1	41.9	52.9	53.8	64.5	73.8	71.0	59.3	49.0	28.1	33.3	47.6
Grand Lake	......	......	29.0	41.2	47.7	53.5	60.0	57.1	......	......	......	......	......
Greeley	21.5	25.7	32.0	51.5	58.9	66.4	74.4	72.9	58.8	50.2	33.4	34.8	48.4
Gunnison	8.1	15.8	34.3	42.4	45.8	55.8	60.2	58.1	50.5	40.5	20.7	24.7	38.1
Hugo	......	......	43.9	50.6	58.8	68.8	......	......	......	48.4	33.7	37.8	......
Husted	21.5	23.5	41.5	49.2	53.5	61.6	66.8	70.6	58.0	48.4	30.5	40.6	47.1
Idaho Springs	23.6	*d*26.2	36.5	44.0	48.6	56.8	57.7	64.1	58.5	[49.0]	32.9	33.5	[44.3]
Julesburg	22.8	24.0	40.0	49.7	56.6	66.6	73.1	76.8	59.9	45.5	34.9	[36.0]	[48.8]
Kit Carson	......	......	38.1	49.0	58.0	65.9	......	......	......	......	34.8	43.7	......
Lamar	20.8	31.0	46.9	55.6	63.3	72.4	79.1	79.8	65.2	52.4	39.6	40.4	53.9
Las Animas	......	......	......	......	......	......	......	64.7	62.3	57.1	29.4	41.9	......

Leadville	*13.9*	*16.5*	*27.1*	*35.6*	*38.7*	*48.0*	*57.1*	*54.9*	*46.0*	*38.1*	*23.3*	*26.0*	*35.4*
Longmont	*21.0*	*25.3*	*40.7*	*50.5*	*55.0*	*62.3*	*72.2*	*72.8*	*56.6*	*50.0*	*31.9*	*39.8*	*48.2*
Magnolia			42.3	56.0	62.8	71.5				52.2	29.6	40.4	
Monte Vista	10.0	13.4	34.6	35.8	51.9	58.2	66.1	64.2	55.3	45.3	28.6	29.7	41.1
Montrose	20.2	27.5	43.5	52.8	57.2	65.3	73.0	72.1	60.5	52.2	33.2	38.4	49.7
Ouray						59.9	64.2	58.8	57.1	42.9	31.4	26.1	
Palmer Lake	27.5	27.8	39.6	46.7	49.6	[62.0]	67.4	67.6	55.7	47.9	31.4	37.6	[46.7]
Paoli	22.8	24.8	39.8	50.4	56.2	67.1	75.6	74.4	59.7	49.6	31.4	[37.0]	[49.1]
Pueblo	24.8	31.2	44.2	53.8	59.8	68.7	75.9	75.8	62.6	53.2	33.0	42.2	52.1
Rifle Falls	[18.5]	24.2	37.5	47.6	50.4	59.9	67.4	67.9	54.6	47.1	27.2	32.7	[44.6]
River Bend			39.4	47.8	59.9	70.4					33.9	38.9	
Rocky Ford	19.5	28.5	45.4	56.0	63.0	72.2	74.6	73.2	60.2	54.0	32.6	35.0	51.2
Saguache	11.0	13.1	36.9	46.8	52.5	58.8	66.6	63.8	54.3	41.5	[25.0]	[30.0]	[41.9]
San Luis Experiment Stat'n	[18.0]	13.4	36.1	46.9	[52.0]	59.2	66.8	63.0	56.4	46.8	25.0	31.8	[43.0]
Sun View			40.0	50.0	56.5	64.6	70.6	70.7	59.2				
Thon	18.6	26.2	38.7	47.5	51.2	60.6	69.7	69.2	57.5	48.2	28.0	37.6	46.1
T. S. Ranche	23.0	28.6	44.6	54.8	60.0	70.2	77.6	74.9	62.0	52.8	34.7	36.8	51.7
Watkins			42.6	49.5							28.3	40.1	
Connecticut:													
Canton	26.0	16.0	29.0	40.0	50.0	58.0							
Colchester	32.7	24.6	37.1	48.3	60.1	65.8	68.9	67.6	62.6	48.2	42.6	37.3	49.6
Fort Trumbull	37.2	26.1	39.2	48.5	58.8	68.6	72.4	70.9	64.8	51.4	45.5	38.4	51.8
Hartford (1)	31.1	20.4	38.5	49.9	64.8	66.5	71.4	68.0	61.2	47.8	43.2	34.6	49.8
Hartford (2)	31.1			49.9	64.8	66.0		68.0		48.0	43.1		
Mansfield	30.8	22.1	34.9	45.6	58.4	65.2	67.9	64.9	59.7	45.8	40.9	35.1	47.6
Middletown	32.6	23.5	37.0	48.7	60.0	67.0	68.9	66.4	61.3	47.2	42.5	36.0	49.3
New Hartford	26.0	17.5	32.1	43.6	59.1	67.0	63.6	60.9	56.0	38.1	32.4	25.1	43.4
New Haven	34.2	25.0	38.7	48.6	59.6	67.4	70.0	68.5	63.0	48.8	44.2	38.8	50.6
New London	36.2	27.2	39.2	48.8	58.7	67.0	69.9	69.0	63.8	50.2	45.8	40.0	51.3
Shelton	31.5	22.8	37.4	48.4	60.2	67.7	69.8	67.6	62.2	47.4	42.2	36.5	49.5
Southington	30.1	23.8	37.2	49.0	61.6	68.8	70.4	67.5	61.9	47.2	41.6	35.4	49.5
Thompson	30.3	21.7	34.3	44.4	59.5	66.8	69.3	65.9	60.4	45.4	40.9	34.8	47.8
Voluntown	33.7	25.4	37.0	47.9	59.1	67.1	68.5	66.5	62.2	48.5	43.9	38.6	49.9
Waterbury	30.9	22.7	37.0	47.4	60.2	68.4	69.7	67.0	62.0	47.9	41.7	35.5	49.2
Delaware:													
Kirkwood	34.0	27.5	37.6	52.0	60.4	72.0	77.8	74.0	64.0	48.0	44.5	42.2	52.8
Newark	36.0	28.6	41.4	52.6									
District of Columbia:													
Kendall Green	37.3	29.6	40.3	53.6	62.8						45.4	45.8	
Washington	39.2	31.1	43.4	54.4	64.6	70.8	75.8	72.4	65.6	52.5	46.2	45.6	55.1
Washington Barracks	[39.0]	[31.0]	[43.5]	55.6	67.0	72.1	72.2	73.6	65.4	52.9	46.5	44.4	[55.3]

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Florida:	°	°	°	°	°	°	°	°	°	°	°	°	°
Altamonte Springs	59.0	57.0	62.4	69.2	74.6	78.8	80.9	80.0	76.1	70.4	68.2	66.1	70.2
Alva	65.2	63.4	63.7	68.8	73.0	78.1	80.9	79.3	79.8	72.6	70.0	64.1	71.6
Archer	[57.0]	[54.0]	61.2	65.7	70.0	78.1	83.8	81.5	79.1	67.5	64.4	62.8	[68.8]
Cedar Keys	57.0	54.0	60.1	68.1	73.0	78.6	81.4	80.4	79.4	68.8	64.3	63.4	69.0
Fort Barrancas	[55.0]	52.8	58.4	66.8	70.9	78.3	81.7	80.0	78.1	67.8	58.9	61.5	[67.5]
Fort Meade	56.0	59.0	58.0	65.0	d71.2	77.4	78.6	80.5	77.0	65.8	61.8	64.3	68.1
Homeland	64.8	61.9	63.4	70.2	76.3	81.4	82.3	80.6	81.2	71.4	68.8	64.2	72.2
Jacksonville	55.2	52.4	59.1	67.8	74.6	78.2	81.9	79.7	78.1	67.3	63.9	62.0	68.4
Jupiter	66.7	64.8	64.8	70.6	75.4	78.8	81.5	79.9	79.8	73.8	73.2	70.5	73.3
Key West	70.0	69.4	69.4	74.1	77.8	80.8	83.2	81.2	81.4	76.8	76.0	71.3	76.0
Kissimmee	61.0	57.0	62.1	69.1	74.5	80.7	82.4	d80.7	80.6	[73.0]	[68.0]	[65.0]	[71.2]
Lake City			59.4	68.0	74.6			78.1	78.2	65.0	62.4	61.5	
Live Oak					f74.5	79.4	81.4	79.4	77.2	64.4	62.0		
Manatee	63.0	61.4	63.6	69.5	78.4	80.4	82.8	81.1	81.0	67.6	68.8	63.0	71.7
Matanzas	56.8	54.0	57.7	66.1	74.1	78.0	[82.0]	79.0	77.2	65.0	[64.0]	62.9	[68.1]
Merritt's Island	61.0	58.0	61.6	68.0	73.9	75.4	79.6	78.8	79.4	73.8	68.3	64.3	70.2
Micco	63.9	60.3	63.4	68.5	73.4	g77.0	g79.0	71.5	81.0	j73.2	68.8	o65.0	70.4
Pensacola	52.7	51.9	58.8	67.8	71.4	77.2	80.8	79.2	77.3	67.2	58.6	62.0	67.1
St. Francis Barracks	56.5	53.5	58.4	66.8	72.2	77.0	80.3	78.0	77.6	67.4	66.9	62.5	68.1
Tallahassee	51.8	51.3	57.6	66.0	72.2	77.3	80.7	77.8	[77.0]	67.2	58.6	58.8	[66.4]
Titusville	60.4	57.0	61.5	68.1	73.1	78.3	80.2	79.4	79.4	69.4	67.4	63.7	69.8
Villa City	61.0	56.7	62.0	69.9	76.8	78.3	80.6	79.2	79.6	71.1	67.0	64.5	70.6
Georgia:													
Albany					73.4	80.0	83.6	79.4	73.6	66.0	59.3		
Allapaha					71.8	78.0	82.4	78.5	75.8	63.1	60.2		
Andersonville	49.3	h52.1	61.4	66.5	69.3	76.1	85.2	82.7	80.2	72.2	65.3	g66.5	68.9
Athens (1)					71.4	77.4	81.6	76.4	71.8	59.4	52.2	54.8	
Athens (2)	43.9	41.8	52.7	63.2	69.7	73.6	78.0	74.0	71.1	59.6	51.5	55.2	61.2
Atlanta	43.8	41.5	52.0	62.4	68.2	73.2	78.5	74.2	70.0	60.2	51.6	57.2	61.1
Augusta	47.6	45.6	54.8	64.6	72.6	78.1	82.0	77.8	74.6	62.8	56.0	57.4	64.5
Bainbridge					71.9	78.6	82.6	80.6	77.8	66.4	68.8		
Camak					73.2	76.8	80.6	76.2	73.0	62.2	54.4		
Cartersville					67.2	74.2	79.9	75.3	70.6	58.4	50.8		

Columbus	....	....	....	....	73.1	71.4	81.8	....	73.8	....	54.6	....	....
Diamond	[43.0]	k47.2	51.6	61.0	64.0	68.9	76.7	70.8	67.0	55.8	51.0	55.2	[59.4]
Duck	38.8	37.8	45.4	57.4	59.6	67.8	73.6	69.6	64.2	53.6	46.8	[50.0]	[55.4]
Eastman	....	....	....	....	74.6	80.0	84.2	82.6	80.8	....	i59.5	....	....
Forsyth	49.2	48.0	57.4	66.7	73.5	77.0	81.5	77.4	75.8	65.7	57.2	61.3	65.9
Fort Gaines	....	....	....	....	....	79.8	84.4	82.6	81.8	78.9	....	....	....
Fort McPherson	....	....	....	....	....	....	79.7	74.7	70.2	60.0	52.9	56.3	....
Gainesville	....	....	....	....	65.1	71.0	76.9	73.0	66.1	58.8	51.0	....	....
Gillsville	....	....	....	....	....	....	80.3	76.0	73.5	63.3	54.2	59.8	....
Griffin	....	....	....	....	71.3	75.9	80.7	70.0	71.8	62.3	53.8	....	....
Hephzibah	50.4	46.9	58.0	64.8	73.0	77.8	80.6	77.0	73.7	63.6	57.0	59.0	65.2
Jesup	....	....	....	....	75.5	78.4	83.6	79.3	76.2	63.6	59.3	....	....
Macon	....	....	....	....	72.9	74.4	80.3	77.7	72.9	64.0	56.1	....	....
Marietta	41.3	38.7	50.5	61.4	66.3	70.9	76.3	71.8	67.8	56.5	49.4	54.7	58.8
Milledgeville	43.2	45.4	53.7	62.8	70.4	76.2	81.0	75.8	72.4	60.8	53.8	55.8	62.6
Millen	....	....	....	....	72.4	77.8	82.5	78.0	74.4	63.2	57.0	....	....
Newnan	....	....	....	....	69.5	75.6	80.0	74.2	68.8	57.9	48.6	....	....
Point Peter	....	....	....	....	68.1	76.0	81.0	75.2	71.0	57.6	51.2	53.8	....
Quitman (1)	53.2	51.8	55.7	67.7	73.8	....	....	....	....	64.2	59.1	60.0	....
Quitman (2)	....	....	....	....	74.0	78.8	81.6	80.4	79.7	67.1	63.8	....	....
Savannah	51.7	48.0	56.3	65.0	73.6	76.0	81.0	77.8	75.0	64.3	59.2	59.8	65.6
Smithville	....	....	....	....	f71.8	79.0	83.6	78.4	e75.3	....	m53.9	....	....
Thomasville (1)	[52.5]	[51.5]	57.9	66.0	72.7	77.6	82.3	78.6	77.1	64.8	59.2	59.8	[66.7]
Thomasville (2)	....	....	....	....	73.6	78.0	82.4	79.5	77.2	a64.8	h59.9	....	....
Toccoa	....	....	....	....	68.9	72.4	78.0	74.5	70.2	59.0	....	....	....
Union Point	....	....	....	....	70.2	75.8	80.0	74.8	71.4	60.1	53.6	....	....
Washington	....	....	....	....	71.0	74.6	79.6	76.0	73.0	60.0	54.6	....	....
Way Cross	....	....	....	....	74.0	77.1	81.8	80.0	75.0	....	60.1	....	....
Waynesborough	....	....	....	....	73.1	76.3	88.4	74.8	71.9	61.3	54.5	....	....
West Point	....	....	....	....	73.2	79.1	83.4	78.7	75.7	63.8	56.2	....	....
Woolley's Ford	[43.0]	[40.0]	[51.0]	59.2	64.7	71.3	75.8	72.1	67.6	54.7	48.6	51.2	[58.3]
Idaho:													
Boisé Barracks	21.1	31.5	49.1	55.9	59.3	69.2	74.3	72.3	58.2	52.8	37.4	32.9	51.2
Boisé City	23.9	34.8	50.2	55.0	58.9	68.9	73.8	72.4	58.8	55.8	40.2	34.1	52.2
Era	....	....	....	....	....	....	72.5	69.2	59.9	50.6	31.8	26.6	....
Fort Sherman	24.8	29.8	43.6	50.9	57.7	63.8	74.2	63.7	54.7	50.8	39.3	30.4	48.6
Kootenai	....	....	....	....	....	....	....	60.0	....	49.0	33.4	25.7	....
Lewiston	30.8	35.0	48.0	60.0	66.0	73.5	81.5	75.0	60.1	54.5	39.0	36.0	55.0
Soda Springs	....	....	....	....	....	58.4	67.5	63.4	49.0	39.6	24.4	27.4	....

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Illinois:	°	°	°	°	°	°	°	°	°	°	°	°	°
Atwood	30.7	25.0			63.2	62.2							
Aurora	26.7	19.0	35.6	49.2	57.4	65.1	71.8	[68.5]	61.5	46.4	36.1	37.4	[47.9]
Beason	33.1	25.0	39.6	51.1	59.1	65.4	72.4	69.7	61.4	47.4	36.5	42.8	50.3
Belvidere	24.9	20.0	38.0	46.8	57.7	64.6	70.8	69.4	60.2	44.5	34.7	37.7	47.4
Brush Hill	31.6	26.0	42.1	54.8	62.7	69.6	75.9	73.9	66.1	[49.0]	[39.0]	[40.5]	[52.6]
Cairo	38.0	35.6	50.0	59.6	65.8	70.8	77.4	75.1	67.0	56.6	44.2	54.0	57.8
Cedarville	23.5	17.0	37.6	47.6	60.5	64.7	71.4	69.7	61.2	[45.0]	[35.0]	[38.0]	[47.6]
Centralia	33.0	30.0	46.0	57.0	61.0	69.0	77.0	76.0	65.0	54.0	40.0	48.5	54.7
Charleston	31.7	26.0	42.1	52.7	62.2		74.8	70.9		49.6			
Chicago	29.0	19.9	38.4	46.8	56.8	62.3	70.5	70.6	62.8	49.4	38.6	40.6	48.8
Collinsville	33.6	30.6	48.7	56.6	62.6	69.6	76.8	73.6	65.6	53.2	40.7	48.8	55.0
Dwight	28.2	22.0	[40.0]	51.6	59.8	67.1	74.4	71.1	64.3	48.9	38.3	41.2	[50.6]
Fairfield	37.3	34.0	49.3		67.1	72.2	80.1	75.7	68.2				
Flora	34.0	30.0	46.0	56.0	63.0	68.0	75.0	70.0	64.0	[52.0]	43.0	48.0	[54.1]
Fort Sheridan	21.7	15.3	34.9	45.1	55.7	59.1	69.7	68.6	60.6	47.0	37.7	39.2	46.2
Gibson City	28.8			51.0						45.8	34.9	41.6	
Golconda	37.1	34.0	48.5	59.5	65.5	70.6	76.8	75.0	67.3	56.0	42.7	53.0	57.2
Greenville	32.9	28.0	43.9	55.9	61.3	68.0	75.0	71.7	64.1	51.9	39.2	46.8	53.2
Griggsville	29.2	30.0	40.9	58.0	67.4	72.3	74.7	76.0	62.9	50.4	36.9	41.0	53.3
Hennepin	26.4	[23.5]	[40.0]	50.1	59.6	66.0	73.0	69.6	63.1	47.0	36.2	38.9	[49.4]
Irishtown	33.8	31.0	44.9		63.2	70.4	77.3	73.8	66.1				
Jordan's Grove	33.9	31.0	45.4	[58.0]	65.8	69.9	76.4	73.2	65.8	55.5	40.6	48.3	[55.3]
Kankakee	30.5	20.4	37.5	48.5	57.2	63.7	71.4	67.1					
Lacon	29.8	23.0	41.3	54.0	60.6	65.6	75.2	72.9	63.8	49.1	37.6	42.1	51.2
Lake Forest	26.8	18.0	35.3	44.3	54.8	60.4	68.9	67.9	59.3	45.6	35.6	36.8	46.1
Lanark	26.0	20.0	42.0	51.8	60.2	64.8	73.8	67.9	59.1	44.7	36.3	38.2	48.7
Louisville							75.8	71.5	62.7	52.6	40.4	48.3	
Martinsville	31.9	27.0	43.1	55.1		68.5				54.6	41.2	47.1	
Mascoutah	32.0			57.2	60.0			72.0	65.2				
Mattoon	31.8	30.0	41.8	53.7	60.4	67.8	73.7	71.1	62.9	50.0	37.4	45.2	52.2
McLeansborough	35.1	32.0	46.7	57.1	63.8	[70.0]	74.9	72.8	65.5	53.1	41.2	51.4	[55.3]
Mount Morris	24.4	18.8	37.8	47.8	56.8	66.2	70.8	71.5	61.2	45.1	[35.0]	[37.5]	[47.7]
Olney	33.4	30.0	43.6	50.5	63.8	68.7	74.6	70.5	63.2	50.6	39.4	47.6	53.0

Oneida	*26.5*	*21.0*	*39.8*	*51.5*	*59.6*	*68.5*	*75.2*	*72.2*	*63.4*	*49.6*	*36.6*	*40.5*	*50.4*
Oswego	*26.6*	*18.5*	*37.3*	*47.2*	*56.8*	*65.0*	*70.8*	*68.6*	*60.3*	*45.5*	*35.4*	*38.3*	*47.5*
Ottawa	*26.2*	*20.0*	*38.4*	*50.1*	*59.8*	*67.9*	*74.2*	*71.4*	*63.6*	*48.8*	*40.3*	*42.1*	*50.2*
Palestine	*33.5*	*30.5*	*45.6*	*57.0*	*63.1*	*68.6*	*75.1*	*70.8*	*63.2*	*50.9*	*40.7*	*48.6*	*54.0*
Pana	*35.7*	*31.0*	*46.8*	*54.4*	*61.1*	*70.4*	*76.6*	*74.1*	*66.4*	*53.1*	*41.8*	*48.2*	*55.0*
Pekin	*31.1*	*22.0*	*42.2*	*55.1*	*60.5*	*69.2*	*75.8*	*72.0*	*63.2*	*47.7*	*50.0*	*43.2*	*52.7*
Peoria	30.6	26.0	43.1	54.9	62.6	69.9	76.6	73.4	64.9	50.2	39.3	43.5	52.9
Petersburgh	34.5	*j*26.0	42.4	53.0	......	......	......	......	......	......	......	......	......
Philo	31.0	24.6	41.3	52.0	60.3	68.1	73.9	72.9	62.0	48.1	37.5	43.4	51.3
Pontiac	28.9	22.0	40.3	50.6	58.2	65.7	73.4	71.7	63.1	48.3	36.7	41.4	50.0
Quincy	......	......	......	......	64.9	70.2	75.9	74.6	......	58.1	......	......	......
Richview	34.5	31.0	46.1	55.5	61.9	68.8	75.3	72.8	65.7	54.5	[41.0]	[50.0]	[54.8]
Riley	24.0	15.7	36.2	46.5	55.6	63.1	69.6	68.1	59.3	45.7	33.9	36.2	46.2
Rockford	25.1	17.4	38.3	48.6	57.4	63.6	72.0	69.8	61.1	45.3	35.0	37.8	47.6
Rock Island Arsenal	27.7	20.6	40.7	50.6	59.8	65.4	70.9	71.7	63.4	50.4	38.2	41.3	50.1
Rushville	29.7	25.0	42.8	......	......	......	......	......	......	......	37.1	41.7	......
Sandwich	28.7	23.6	41.8	52.0	61.8	68.6	74.5	72.0	64.4	49.1	38.4	41.3	51.4
Seneca	29.1	*a*20.4	37.5	47.8	56.4	64.0	71.0	67.4	......	......	......	......	......
South Evanston	25.8	17.0	*a*36.4	*f*45.6	56.2	60.6	69.8	67.2	61.8	47.8	[38.0]	[40.0]	[47.2]
Springfield	30.8	25.4	43.3	54.1	60.8	67.7	74.6	72.3	64.4	51.0	38.2	44.4	52.2
Sumner	34.0	30.0	43.5	54.7	62.5	......	......	......	......	......	......	......	......
Sycamore	26.8	17.8	36.6	47.3	55.9	63.9	69.6	67.6	59.3	44.6	34.4	37.3	46.8
Watseka	29.2	22.0	39.0	51.2	58.9	66.3	71.9	68.7	61.9	46.4	38.3	41.9	49.6
Wheaton	26.9	......	36.5	......	......	62.3	69.3	......	58.8	44.3	34.4	36.7	......
White Hall	31.1	28.0	46.0	58.9	62.7	69.0	78.6	76.4	66.3	53.2	40.1	47.0	54.8
Willow Hill	34.5	30.0	45.6	56.5	......	68.0	75.1	......	......	......	......	......	......
Windsor	32.5	27.0	41.0	53.9	61.2	67.9	75.0	73.5	64.6	51.6	39.0	[45.0]	[52.7]
Winnebago	23.5	17.0	38.0	48.9	58.8	67.3	75.4	72.1	63.2	47.6	35.1	38.6	48.8
Woodstock	23.4	......	......	......	......	59.1	......	......	......	......	31.2	34.1	......
Indiana:													
Angola	30.0	20.4	38.0	49.2	61.4	68.5	74.2	73.1	61.4	47.4	39.2	42.3	50.4
Blue Lick	36.2	31.4	46.0	56.6	63.1	69.0	74.2	72.6	65.0	53.8	41.3	49.6	54.9
Butlerville	35.7	29.7	45.3	53.9	61.7	70.5	76.1	71.6	63.6	49.2	40.2	47.3	53.7
Cannelton	37.1	34.6	44.0	54.4	63.0	69.5	75.9	75.1	64.0	56.5	42.0	45.0	55.1
Columbia City	28.9	22.1	36.6	47.8	57.3	63.9	70.2	65.9	59.1	45.5	38.0	40.7	48.0
Columbus	33.9	28.5	41.1	52.4	61.0	63.5	73.2	69.5	63.1	51.0	41.7	46.4	52.5
Connersville	31.9	26.5	43.3	52.8	61.5	67.7	73.1	72.9	65.0	48.8	39.8	45.7	52.4
Dana	28.0	25.5	42.2	53.5	61.8	67.6	76.1	72.4	66.6	51.0	35.6	45.2	52.1
Degonia Springs	37.5	33.9	45.4	55.1	62.1	69.7	75.1	72.3	65.3	52.6	43.2	49.1	55.1
Delphi	30.5	23.9	37.7	50.2	59.6	[66.0]	73.1	68.4	60.2	44.2	36.5	40.7	[49.2]
Earl Park	29.8	21.8	38.8	48.7	58.1	65.6	71.8	68.3	......	......	......	......	......

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Indiana—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Farmland	32.9	25.8	42.4	51.5	61.0	67.4	73.7	71.9	63.1	48.9	40.2	45.8	52.0
Franklin	32.6	25.2	43.0	53.4	61.8	68.3	[74.0]	[70.5]	61.9	50.0	39.7	45.6	[52.2]
Huntertown	......	25.1	40.6	51.0	61.6	68.0	74.2	70.4	71.4	......	......	......	......
Huntingburgh	35.5	31.7	46.0	56.7	62.6	71.8	77.3	74.4	67.0	53.8	43.4	50.0	55.8
Indianapolis	34.2	27.0	44.4	53.8	61.6	67.8	74.2	71.4	64.5	50.8	40.9	46.2	53.1
Jeffersonville	36.1	33.1	46.3	57.4	64.9	71.2	76.2	73.5	65.1	53.9	43.5	49.6	55.9
Laconia	35.2	31.8	47.4	55.0	62.8	71.0	......	......	......	......	......	......	......
La Fayette (1)	30.3	21.2	39.8	50.8	59.5	66.2	73.1	68.3	61.3	47.9	40.3	43.8	50.2
La Fayette (2)	31.1	23.7	38.3	50.7	60.1	65.8	72.5	68.1	......	......	......		......
Lawrenceburgh	34.2	28.8	42.3	51.9	60.1	67.7	73.3	68.6	......	......	......		......
Lebanon	30.0	23.0	39.0	49.4	58.0	64.3	70.6	67.6	......	......	......	......	......
Marengo	38.6	34.9	45.4	58.8	64.6	71.9	76.4	73.6	66.2	55.2	45.3	51.2	56.8
Marion	29.2	22.1	39.5	50.9	58.0	66.0	72.7	71.9	61.5	44.8	39.3	43.3	49.9
Mauzy	29.6	22.8	38.3	49.6	60.4	68.8	73.2	66.2	56.0	43.4	36.2	41.8	48.9
Mount Vernon	37.2	34.7	45.3	[57.0]	61.1	70.2	76.0	72.0	63.9	52.0	41.0	49.0	[55.0]
Muncie	32.7	25.6	43.3	50.5	61.1	68.5	73.5	......	......	......	......	46.6	......
New Providence	e37.2	31.2	44.7	53.0	62.0	70.4	76.8	71.8	61.0	[55.0]	[44.0]	[50.5]	[54.8]
Point Isabel	26.3	23.0	42.1	52.4	61.2	67.6	75.1	70.0	61.0	43.9	38.5	43.5	50.4
Princeton	35.3	31.3	46.5	55.2	64.4	70.7	76.7	73.0	63.7	51.3	40.6	49.0	54.8
Richmond	31.4	24.7	37.9	47.4	57.9	63.0	74.0	68.8	61.0	47.8	39.2	43.0	49.7
Rockville	31.0	28.0	39.0	51.0	62.4	67.0	73.0	69.6	65.0	52.0	45.0	47.2	52.5
Salem	33.2	30.4	41.4	51.3	60.5	......	......	......	......	......	......	......	......
Scalesville	37.2	33.3	49.0	58.2	65.5	71.7	77.2	75.0	67.1	55.0	43.6	51.5	57.0
Seymour	36.9	31.4	43.2	52.7	60.2	67.7	72.9	68.6	60.2	51.0	42.2	48.0	52.9
Shelbyville	......	......	......	......	......	......	74.6	69.4	......	51.3	39.7	46.6	......
Spiceland	34.4	27.4	43.0	52.6	62.3	68.4	74.0	70.4	65.0	49.0	40.7	46.5	52.8
Sunman (1)	33.4	26.9	42.4	51.8	60.0	66.2	75.4	69.0	62.6	47.9	40.1	45.0	51.7
Sunman (2)	32.1	26.0	41.1	52.1	61.1	66.7	73.4	68.4	......	......	......	......	......
Vevay	37.0	32.1	45.9	56.1	64.2	70.2	75.3	72.4	65.3	51.6	43.5	49.0	55.2
Worthington	31.6	28.7	41.1	53.0	60.7	67.8	73.1	69.7	61.5	50.5	38.8	45.3	51.8
Indian Territory:													
Caddo Creek	49.8	48.0	51.4	63.8	67.0	f75.5	g82.4	l78.0	70.3	69.6	c46.6	k56.8	63.3
Fort Gibson	40.8	41.8	50.6	63.8	66.8	73.3	81.5	77.1	68.9	61.3	44.3	53.5	60.3

Fort Reno (1)	*38.0*	*38.1*	*49.8*	*62.2*	*68.0*	*73.0*	*80.6*	*78.2*	*69.0*	*62.0*	*43.2*	*53.8*	*59.7*
Fort Reno (2)	*36.8*	*38.0*	*51.4*	*64.3*	*g69.3*	*72.5*	*80.0*	*77.4*	*68.4*	*61.2*	*42.7*	*52.6*	*59.6*
Fort Sill (1)	*39.2*	*39.7*	*52.0*	*63.3*	*68.1*	*72.9*	*79.9*	*78.4*	*68.6*	*62.4*	*44.2*	*53.8*	*60.2*
Fort Sill (2)	*[39.5]*	*[40.0]*	*52.0*	*63.6*	*67.8*	*73.8*	*80.2*	*78.0*	*68.9*	*62.2*	*46.0*	*52.3*	*[60.4]*
Fort Supply (1)	*37.6*	*37.3*	*49.6*	*60.8*	*68.4*	*72.6*	*80.4*	*79.0*	*66.0*	*59.0*	*41.0*	*50.7*	*58.5*
Fort Supply (2)	*32.8*	*34.7*	*48.3*	*60.7*	*66.7*	*73.7*	*80.1*	*79.0*	*68.6*	*58.6*	*39.2*	*49.2*	*57.6*
Jimtown	51.4	44.5	......	......	......	74.4	l72.0	......	72.5	......	......	......	......
Lehigh	......	......	......	63.1	51.3	71.6	80.0	79.6	66.8	58.0	......	......	......
Oklahoma	......	......	......	......	......	h72.4	79.0	76.8	66.8	......	......	......	......
Iowa:													
Amana	20.4	17.2	37.2	49.8	59.8	66.6	73.3	70.2	61.0	46.6	33.5	37.6	47.8
Ames	20.7	17.6	39.3	49.9	60.0	67.4	73.2	71.4	61.2	46.9	31.7	36.9	48.0
Bancroft	15.6	11.0	34.1	[48.0]	d59.6	68.7	72.5	72.6	60.2	45.6	28.8	32.1	[45.7]
Belle Plaine	......	......	......	......	......	......	......	69.8	59.0	45.6	32.0	37.0	......
Blakeville	18.3	12.9	36.2	46.2	57.0	64.6	72.6	69.1	64.0	43.6	36.0	34.6	46.3
Carroll	......	......	......	......	......	......	......	k72.0	59.0	44.2	27.6	35.8	......
Carson	......	......	......	......	......	......	......	72.8	62.3	50.8	32.6	37.7	......
Cedar Rapids	22.4	18.3	39.8	48.1	58.6	65.4	72.6	71.2	60.6	46.8	35.0	38.6	48.1
Clarinda	23.7	23.0	41.2	53.2	62.5	69.6	75.2	72.7	62.2	49.8	33.5	39.3	50.5
Clinton	24.4	18.8	39.2	50.4	59.9	67.3	73.2	69.8	61.0	46.1	35.1	38.2	48.6
Cresco	17.6	11.0	35.1	46.3	56.0	63.0	69.7	69.1	57.7	43.0	28.2	31.3	44.0
Cromwell	22.0	23.0	......	f50.2	60.4	67.2	72.9	......	......	......	......	......	......
Davenport	26.4	20.0	41.0	50.8	60.0	67.0	73.8	72.1	62.8	49.0	36.6	39.6	49.9
Des Moines	23.0	21.0	42.2	51.8	60.9	67.8	73.8	72.1	62.8	49.2	34.8	39.6	49.9
Des Moines (near)	21.9	16.8	41.1	51.5	61.1	67.9	[73.8]	71.4	[62.5]	[49.0]	35.0	39.8	[49.3]
Dubuque	23.6	17.4	41.0	50.0	59.4	66.2	73.0	71.6	62.8	47.6	34.8	37.4	48.7
Dunkerton	j23.1	13.8	h40.2	f49.7	g60.3	f66.9	......	......	......	......	......	......	......
Dysart	20.1	15.4	35.8	45.2	56.8	64.4	71.9	68.4	......	......	......	......	......
Eagle Grove	......	......	......	......	58.1	69.6	75.2	73.8	62.6	47.5	31.7	34.2	......
Elkader	i21.0	14.8	39.2	48.3	60.1	67.8	73.4	69.2	59.8	43.0	32.1	34.9	47.0
Fayette	18.6	14.1	37.9	47.1	56.1	63.7	70.8	69.1	59.1	43.8	30.3	33.1	45.3
Fort Madison (near)	27.7	23.8	42.6	53.9	63.4	75.7	78.0	75.6	63.8	49.6	36.5	41.6	52.7
Gillett	14.8	12.7	32.8	46.2	57.0	65.0	69.5	68.4	54.4	40.4	[30.0]	[35.0]	[43.8]
Glenwood (1)	23.7	d21.0	43.4	55.9	[62.5]	72.0	76.3	74.7	c65.2	55.3	35.9	41.7	[52.3]
Glenwood (2)	24.5	23.4	43.8	50.2	59.2	65.6	72.6	76.0	58.7	44.6	33.5	34.8	48.9
Grinnell	21.6	18.1	38.5	49.7	59.8	66.6	73.3	71.7	62.2	44.0	35.4	35.6	48.0
Hampton	17.9	20.0	36.6	46.6	56.2	63.6	71.3	68.4	58.6	43.3	28.3	31.7	45.2
Humboldt	18.5	11.8	b35.9	d44.4	g56.2	f69.6	[71.5]	71.0	b59.8	45.6	29.5	33.6	[45.6]
Independence	21.0	16.5	39.4	[49.0]	59.7	66.8	[72.0]	71.0	60.5	46.0	[34.0]	35.0	[47.6]
Iowa City	24.6	19 1	37.4	49.4	60.0	68.1	73.8	69.6	61.3	47.8	36.9	40.9	49.1
Keokuk	28.2	24.6	43.0	53.9	61.8	68.3	75.2	73.2	64.0	50.8	37.6	42.7	51.9

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Iowa—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Logan	24.1	22.9	42.1	54.2	62.7	70.7	74.0	72.4	62.2	52.3	35.4	39.6	51.0
McCausland	......	......	......	......	......	......	......	73.4	63.8	48.3	36.2	39.7	......
Manson	19.2	17.8	38.0	49.6	57.2	68.6	71.7	73.1	60.4	45.9	32.6	35.6	47.5
Maquoketa	......	......	......	......	59.6	66.7	73.8	70.5	62.2	44.2	34.9	36.8	......
Monticello	22.3	17.9	39.4	48.8	59.9	66.8	73.2	69.7	61.1	44.7	33.0	36.9	47.8
Mount Pleasant	26.0	20.0	41.9	50.6	60.7	69.7	75.4	72.0	61.0	47.0	33.6	37.3	49.6
Mount Vernon	23.7	18.4	41.8	52.6	62.2	69.6	75.6	73.0	62.8	49.1	34.8	37.8	50.1
Muscatine	25.8	21.4	40.2	50.5	59.6	66.9	73.0	70.0	62.0	49.1	36.7	39.6	49.6
Osceola	16.5	21.4	40.3	50.6	......	......	......	......	......	......	......	......	......
Oskaloosa (1)	24.8	21.0	42.8	53.0	62.6	69.0	74.6	73.0	62.6	48.7	34.8	39.5	50.5
Oskaloosa (2)	......	......	......	53.0	62.4	69.8	76.4	74.6	......	......	......	......	......
Sac City	18.7	15.8	36.6	48.0	57.3	65.4	69.6	69.0	55.9	44.9	29.7	33.0	45.3
Sioux City	......	......	......	......	......	......	76.1	73.2	61.0	50.4	33.0	35.2	......
Storm Lake	......	......	......	......	......	......	......	71.1	58.7	45.7	29.0	32.2	......
Vinton	21.2	17.3	39.3	49.8	59.3	65.6	71.1	69.5	59.9	45.2	31.3	36.4	47.2
Washington	26.8	23.0	42.8	54.4	64.9	72.6	79.1	78.6	65.5	50.1	36.8	40.9	53.0
Webster City	[17.0]	15.6	36.8	49.0	58.9	66.5	72.5	71.0	59.8	44.9	28.8	33.0	[46.2]
Wesley	17.5	12.8	36.6	47.2	56.4	63.6	69.6	69.1	56.6	43.6	27.2	31.4	44.3
West Bend	......	......	......	......	......	......	72.6	69.4	57.9	42.7	28.4	31.6	......
Kansas:													
Allison	19.3	22.4	37.1	52.2	60.5	68.6	74.8	74.6	62.0	50.1	31.0	35.1	49.0
Augusta	......	......	......	......	65.8	73.6	78.3	76.6	68.7	55.6	......	44.2	......
Bendena	32.2	30.8	48.1	59.6	67.4	76.6	78.6	72.8	63.0	50.1	34.6	39.8	54.5
Bunker Hill	......	......	43.6	......	65.9	......	80.9	76.2	70.6	56.8	35.6	43.8	......
Burr Oak	20.6	......	......	54.3	......	71.2	75.9	73.7	63.4	......	......	......	......
Cawker City	24.9	28.2	45.9	58.0	65.7	72.8	77.1	76.7	66.8	55.2	37.3	41.5	54.2
Colby	19.9	24.4	39.8	50.7	57.9	66.8	74.0	......	......	......	......	......	......
Collyer	......	......	......	......	63.2	71.1	......	81.0	74.1	55.0	39.7	42.1	......
Concordia	29.0	26.2	44.1	55.6	62.4	70.5	75.7	74.1	64.0	53.1	36.6	42.0	52.8
Concordia (near)	26.6	25.7	43.6	[55.0]	62.0	[72.0]	77.0	70.5	62.6	52.6	34.8	40.2	[51.9]
Conway	[30.5]	[29.0]	[47.0]	56.6	57.2	72.4	78.6	74.7	66.1	53.2	36.3	44.5	[53.8]
Cunningham	28.5	28.6	43.8	57.7	65.8	69.8	76.7	75.3	64.8	54.9	35.1	42.8	53.6
Dodge City	28.9	29.0	45.8	56.6	63.7	69.8	77.5	76.9	66.3	55.6	37.4	44.6	54.3

Elco				*58.3*	*64.8*	*72.4*		*72.3*	*64.0*	*54.8*			
Elk Falls	*35.5*	*33.0*	*48.8*	*60.2*	*67.2*	*73.9*	*79.6*	*78.0*	*68.4*	*[56.0]*	*40.8*	*48.9*	*[57.5]*
Ellis	*[27.5]*	*[26.0]*	*47.4*	*[56.0]*	65.6	73.6	78.2	71.0	64.0	58.3	35.9	41.6	[53.8]
Ellsworth			45.3		70.9	77.7		78.5		62.3		41.6	
Emporia	31.4	29.7	45.6	56.6	64.4	70.9	76.6	74.0	63.5	54.8	38.4	45.2	54.3
Englewood	31.2	33.0	47.3	59.0	68.2	73.8	80.1	79.0	66.7	58.0	38.2	47.0	56.8
Fort Hays	36.7	27.6	44.8	56.3	61.4	69.3	76.6	76.5	66.5	55.2	[37.0]	[46.5]	[54.5]
Fort Leavenworth	29.3	28.9	46.6	57.6	67.4	71.6	76.6	73.5	64.3	54.7	36.6	46.2	54.4
Fort Riley	28.8	26.9	44.0	56.4	64.1	72.5	77.4	74.5	66.3	54.8	38.1	43.0	53.9
Fremont					60.9	68.8	76.4	77.6	66.9	54.0	36.9	39.8	
Gibson	23.9	26.9	34.8	53.7	55.8	66.4	79.3	78.9	64.6	[55.0]	[39.0]	[42.5]	[51.7]
Globe	29.3	27.0	43.5	54.9	63.0	71.4	76.4	73.4	63.3	53.3	37.4	44.2	53.1
Gove City	23.4	27.4	43.2	[55.0]	65.0	74.0	80.3	84.6	68.3	56.4	38.0	45.0	[55.0]
Grainfield					55.3	64.8				57.0		41.7	
Grenola	32.8	30.5	45.7	58.8	65.2	72.4	77.6	75.7	64.9	58.7	39.6	46.8	55.7
Grinnell			37.6		62.0	74.6		80.6	71.2		47.1		
Halstead	31.3	31.0	45.7	56.5	64.5	71.2	77.5	74.8	66.5	55.3	37.9	44.3	54.7
Havensville	26.0	23.4	41.6	54.6	63.0	71.0	75.9	74.9	63.3	52.7	35.5	42.2	52.0
Horton				54.6	64.7		72.1	73.2	64.4	52.6			
Independence	34.0	31.8	45.8	58.6	64.6	70.8	78.8	75.8	66.2	57.4	39.7	49.3	56.1
Kellogg									68.0	58.0	39.3	47.9	
La Harpe	33.0	28.0	43.2	56.0	64.2	70.4	77.5	73.6	64.5	54.2	37.2	45.2	54.0
Lakin									71.2	61.6	42.3	53.2	
Lawrence	30.3	27.6	41.6	56.4	64.2	71.2	76.0	72.7	63.2	53.6	38.2	44.8	53.3
Leavenworth	29.8	27.5	45.2	55.4	63.8	70.6	76.8	74.0	64.7	54.2	39.2	45.3	53.9
Leavenworth Mil. Prison	29.9	23.6	44.2	53.8	62.7	70.7	76.0	73.9	64.0	52.3	36.6	42.5	52.5
Lebo	30.0	29.2	45.8	56.4	64.4	68.6	78.2	75.8	62.0	56.0	39.4	45.8	54.3
Leoti				54.1	61.2		77.7	80.2	64.9				
Lincoln									66.1	55.5	36.3	41.4	
McAllaster			42.2		62.5	71.6				50.2	36.4	42.2	
Macksville	32.3	29.4	45.0	57.6	63.3	69.9	77.0	77.0	66.9	48.8	[36.0]	41.3	[53.7]
Manhattan (1)					63.1	70.3	75.1	74.1	63.2	52.2	35.2	41.5	
Manhattan (2)	26.6	25.0	42.1	55.2	a63.9	72.4	77.3	75.5	62.7	d53.0	35.6	41.1	52.5
Morse	28.2	35.0	39.7	52.0	58.1	67.2	70.4	68.6	60.4	51.1	35.2	36.0	50.2
Offerle	[30.0]	[31.5]	44.2	54.1	64.8	69.9	78.5	76.3	64.2	55.5	34.9	41.8	[53.8]
Richfield								86.1	71.8	62.4	40.0	47.7	
Rome	35.3	31.5	49.5	58.2	65.5	71.0	77.1	[76.0]	[67.0]	58.0	40.4	47.6	[56.4]
Russell			42.4		62.5	71.5				58.4		47.0	
Salina	31.3	30.5	45.0	60.1	65.4	73.7	79.5	77.2	53.6	58.8	40.3	44.4	55.0
Santa Fé	32.4	31.8	42.5					78.3	67.8				
Sedan	34.5	32.7	47.0	59.0	65.7	72.0	78.2	76.8	66.3	57.6	40.7	49.1	56.6

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Kansas—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Seneca	25.5	23.3	42.6	55.1	64.7	71.5	75.5	73.3	63.6	52.7	35.4	41.9	52.1
Topeka	28.7	26.8	44.9	54.8	63.0	69.2	75.0	72.2	63.2	52.8	37.4	45.1	52.8
Tribune	20.2	19.8	43.0	53.5	61.7	69.4	77.6	78.3	64.0	53.6	35.0	42.0	51.5
Victoria	30.8	31.5	48.3	60.5	....	73.1	....	....	68.9	....	....	47.8	....
Wa Keeney	....	....	42.9	....	63.6	....	....	....	....	....	39.3	43.7	....
Wakefield	30.0	27.8	44.7	57.5	65.4	73.6	78.3	76.7	....	....	....	....	....
Walnut Grove	28.8	23.0	42.7	52.2	59.5	70.8	74.6	75.5	....	....	....	....	....
Wellington	33.4	31.5	46.9	58.3	66.4	65.8	77.6	76.5	66.5	57.1	38.2	46.2	55.4
Weskan	....	....	....	....	62.0	69.7	75.1	72.8	64.8	53.2	35.9	42.2	....
Wichita	32.8	31.5	46.5	57.8	64.7	70.3	77.4	75.5	66.4	56.4	39.4	46.4	55.4
Winona	....	....	45.3	....	61.8	....	....	75.9	....	....	....	44.6	....
Yates Center	31.5	29.1	43.8	55.8	63.6	69.4	76.6	72.9	64.0	54.8	37.9	46.0	53.8
Kentucky:													
Ashland	33.3	28.7	39.5	49.3	59.4	65.0	69.5	65.3	59.5	45.2	40.8	44.1	50.0
Bernstadt	....	34.9	46.6	57.6	63.1	69.0	76.9	71.4	....	....	....	....	....
Bowling Green	40.2	38.4	51.3	61.0	67.2	73.8	78.8	77.0	69.2	57.7	48.1	55.8	59.9
Canton	....	....	....	....	....	....	75.0	70.7	65.0	53.5	43.8	52.0	....
Earlington	....	....	....	....	....	....	74.8	71.9	67.4	54.6	45.2	53.3	....
Falmouth	34.3	29.8	42.4	53.7	61.1	67.7	73.4	70.7	61.8	47.9	41.2	46.0	52.5
Frankfort	36.7	32.7	44.8	55.0	62.2	69.4	75.1	71.0	64.4	50.7	42.5	49.2	54.5
Franklin	39.9	37.2	50.7	61.0	66.1	71.4	77.1	74.5	68.6	56.5	46.4	55.1	58.7
Lexington	37.4	31.6	45.8	55.0	62.8	69.2	75.4	72.1	65.4	52.3	43.0	50.0	55.0
Louisville	38.4	32.9	48.2	57.8	64.1	70.6	76.4	73.9	67.0	56.0	44.8	51.6	56.8
McHenry	....	....	*f* 45.4	*g* 60.1	*d* 63.8	*d* 70.7	75.7	....	....	....	....	....	....
Madisonville	37.8	35.0	47.5	57.7	64.6	71.1	76.2	....	....	....	....	....	....
Millersburgh	41.3	36.7	48.6	57.3	[63.0]	68.8	[75.0]	[72.0]	66.2	53.2	46.6	52.6	[56.8]
Mount Sterling	36.0	31.0	43.6	53.3	60.9	66.6	73.4	70.3	62.9	48.5	41.6	47.9	53.0
Murray	....	....	....	....	....	....	....	71.0	66.7	54.8	44.0	52.4	....
Newport Barracks	36.0	29.9	44.4	54.0	62.7	69.6	75.2	72.2	66.2	50.0	42.0	47.0	54.1
Owensborough	36.8	*d* 35.4	*d* 47.1	60.3	67.5	....	....	....	....	....	....	....	....
Owenton	38.1	30.7	45.0	56.2	64.0	70.5	74.8	*e* 72.4	*c* 63.2	*d* 51.4	40.7	48.6	54.6
Pellville	39.4	36.8	49.8	57.6	64.9	69.7	75.4	73.2	68.8	[54.0]	48.2	[53.0]	[57.6]
Richmond	38.0	33.0	46.0	56.3	64.4	71.8	79.1	75.8	65.6	52.5	44.3	50.4	56.4

Shelbyville	*36.5*	*33.0*	*46.0*	*56.2*	*63.2*	*69.6*	*75.8*	*72.5*	*64.4*	*51.4*	*42.4*	*49.1*	*55.0*
South Fork	*37.7*	*35.9*	*45.0*	*e56.3*	*62.2*	*68.7*	*75.0*	*71.0*	*64.8*	*51.6*	*44.8*	*51.5*	*55.4*
Springfield	....	....	....	....	....	....	*d72.8*	*e71.8*	*h64.4*	*53.4*	....	*53.6*	....
Louisiana:													
Abbeville	52.2	55.1	60.0	69.6	68.7	79.1	83.3	77.8	[77.0]	69.7	57.5	65.6	[68.0]
Alexandria	[49.0]	52.0	58.6	68.2	70.8	75.6	82.0	80.0	76.0	67.8	55.9	[64.0]	[66.7]
Amité City	50.9	51.3	58.3	66.6	72.1	76.2	78.2	77.4	76.2	65.9	54.8	62.0	65.8
Baton Rouge	49.9	54.6	61.0	....	75.4	79.2	....	....	....	....	54.0	....	....
Cameron	[53.0]	53.6	60.4	70.5	75.3	81.2	84.5	81.7	78.7	70.0	56.2	64.4	[69.1]
Cheneyville	50.5	....	....	....	69.6	74.4	80.3	78.9	76.0	66.6	59.0	....	....
Clinton	46.6	49.2	54.8	66.7	72.0	77.6	79.9	73.4	74.3	65.5	53.0	59.6	64.4
Convent	50.0	51.8	59.1	67.2	71.8	76.0	79.3	74.2	[77.0]	67.4	[58.0]	[64.0]	[66.3]
Coushatta Chute	....	....	....	....	71.4	77.8	83.1	78.8	74.1	63.2	52.0	61.2	....
Crowley	48.9	52.2	56.9	68.5	72.4	78.2	82.1	77.1	76.0	64.2	53.9	63.2	66.1
Donaldsonville	[52.5]	49.6	55.1	63.8	68.0	[78.0]	[82.0]	78.2	75.7	65.0	54.3	60.2	[65.2]
Emilie	....	....	....	....	....	79.0	82.7	79.3	77.2	66.6	57.2	61.6	....
Farmerville	47.1	51.1	55.2	66.0	70.0	76.8	81.5	74.0	73.6	63.6	51.2	58.7	64.1
Franklinton	54.1	56.2	59.9	68.8	71.2	77.7	81.5	80.2	76.9	[70.0]	[60.0]	[64.0]	[68.4]
Grand Cane	45.5	50.6	57.4	69.1	72.0	77.8	82.6	[79.0]	h73.3	67.0	53.2	61.8	[65.8]
Grand Coteau	52.9	54.8	60.4	70.2	73.2	78.3	[82.5]	78.9	76.4	67.6	56.2	65.0	[68.0]
Hammond	49.8	51.6	57.8	68.2	71.2	[76.0]	82.8	80.0	77.4	65.5	54.7	61.0	[66.3]
Houma	52.3	53.8	59.9	69.2	72.5	78.1	81.2	78.3	76.2	65.9	55.3	62.0	67.1
Jackson Barracks	[53.0]	53.5	59.0	69.6	69.7	78.6	80.8	81.9	[78.5]	[70.5]	59.2	61.0	[67.9]
Jeanerette	....	....	....	70.3	....	76.3	79.4	78.6	77.6	67.1	60.2	65.2	....
Jennings	....	....	....	74.0	72.5	79.8	83.5	....	....	....	....	....	....
La Fayette	[52.5]	[54.5]	[61.0]	69.8	73.0	79.2	82.9	80.0	76.7	67.4	56.2	63.1	[68.0]
Lake Charles	53.3	54.3	51.3	68.9	73.1	79.7	80.7	84.0	78.7	68.3	51.6	60.1	67.0
Lake Providence	49.7	48.9	63.2	69.6	71.9	77.0	....	79.7	....	....	....	....	....
Liberty Hill	48.0	49.5	57.0	68.0	71.5	77.5	82.5	81.5	76.0	66.0	52.0	62.0	66.0
Luling	49.8	51.2	57.6	64.0	70.0	70.2	[82.0]	78.4	74.7	63.7	54.7	60.0	[64.7]
Mandeville	53.1	51.1	58.3	68.2	73.1	78.1	83.1	80.2	77.1	66.6	55.8	60.7	67.1
Marksville	50.5	52.6	58.9	68.2	72.5	77.7	82.4	79.5	d75.7	66.3	54.9	63.8	66.9
Maurepas	55.5	[53.5]	55.5	67.8	71.0	76.5	81.5	78.2	76.3	64.8	55.5	61.7	[66.5]
Minden	49.6	51.0	56.4	[69.0]	72.8	77.6	82.7	80.6	75.8	66.2	51.8	61.6	[66.3]
Monroe	47.9	49.5	57.8	67.9	71.0	76.7	83.1	79.2	74.0	63.8	51.8	60.9	65.3
Natchitoches	....	....	....	....	69.9	77.2	82.8	77.6	73.2	63.2	50.2	....	....
New Iberia	55.0	54.0	61.5	70.4	72.9	78.4	81.6	[80.0]	m76.6	71.3	60.5	66.2	[69.0]
New Orleans	53.4	53.4	61.0	70.2	73.8	78.2	82.6	80.6	78.6	70.4	58.7	64.3	68.8
Plaquemine	48.8	51.2	57.7	69.0	71.8	76.5	80.8	78.7	76.2	65.0	53.1	61.0	65.8
Pointe à la Hache	....	....	....	....	73.7	79.6	82.9	81.5	79.6	69.8	58.8	59.4	....
Port Eads	54.9	66.7	60.2	69.1	73.4	78.6	82.2	80.9	80.2	72.0	63.3	62.0	70.3

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Louisiana—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Rayville	48.6	48.8	58.2	......	......	79.7	......	......	......	......	......	......	......
Shell Beach	51.0	53.8	60.7	71.3	74.4	79.1	83.2	80.3	78.0	69.2	57.3	63.7	68.5
Shreveport	47.9	50.2	58.6	69.0	71.3	76.8	82.8	79.9	74.2	65.5	51.6	63.2	65.9
Sugar Experiment Station	50.7	53.3	52.6	67.2	72.2	78.5	83.2	79.4	77.4	66.6	57.6	[63.0]	[68.8]
Trinity	48.4	[51.5]	[57.0]	67.0	[72.0]	77.6	83.0	79.6	75.8	63.8	53.0	62.2	[65.9]
Vidalia	50.3	50.4	58.1	70.4	74.3	75.1	83.7	81.6	78.3	67.7	54.6	63.5	67.4
West Melville	[51.0]	50.6	59.2	70.0	72.2	77.7	82.2	78.6	77.2	66.8	54.1	63.8	[67.0]
Winnfield	......	......	......	......	......	c79.6	84.3	79.7	75.0	65.5	......	......	......
Maine:													
Bar Harbor	29.2	21.0	34.5	44.4	54.4	63.0	65.2	64.2	60.6	47.6	41.6	35.0	46.[illegible]
Belfast	27.4	20.4	34.7	47.7	55.1	62.3	64.5	64.5	59.9	45.7	40.3	30.1	46.0
Calais	24.7	18.0	33.6	45.0	56.7	64.8	65.8	64.6	60.6	45.0	[40.0]	[30.0]	[45.7]
Cornish	25.7	17.4	33.4	46.4	59.9	68.1	68.8	66.6	61.1	43.8	37.2	28.4	46.4
Eastport	28.0	20.0	33.0	41.4	49.4	56.9	60.7	60.3	58.0	45.8	39.8	28.4	43.5
Fairfield	23.2	14.8	31.4	45.4	56.7	64.0	66.2	63.3	59.1	42.3	36.2	23.0	43.8
Gardiner	26.7	18.7	33.7	45.0	56.7	[64.0]	66.4	64.0	60.3	44.6	39.4	29.2	[45.7]
Kennebec Arsenal	35.8	26.0	33.2	*38.8	*51.4	59.6	66.1	62.2	58.3	43.2	37.2	25.2	44.8
Kent's Hill	25.2	16.5	32.2	45.3	56.8	d64.8	67.3	65.7	60.2	44.4	38.3	h25.0	45.1
Lewiston	24.1	15.3	32.1	44.2	56.7	65.9	67.8	65.0	60.8	43.3	36.8	26.4	44.9
Mayfield	[22.5]	[14.0]	28.6	43.2	56.4	63.2	65.1	61.7	56.6	39.2	32.8	[23.0]	[42.2]
Orono	24.7	16.0	33.2	45.1	58.4	64.8	66.4	64.3	60.5	43.6	38.6	27.5	45.3
Petit Manan	29.9	21.8	33.8	42.1	51.4	[60.0]	60.9	59.5	55.8	45.6	39.0	31.5	[44.3]
Portland	29.1	20.3	34.6	44.4	55.2	64.0	66.4	64.6	59.7	46.2	40.9	32.0	46.4
West Jonesport	......	......	......	41.4	59.0	56.4	60.9	58.0	56.3	......	41.3	30.2	......
Maryland:													
Baltimore	38.9	30.8	43.4	54.6	65.8	71.5	76.6	73.8	66.5	53.8	47.7	46.0	55.8
Barren Creek Springs	39.6	31.6	41.6	54.1	e65.8	71.2	75.7	76.0	66.0	54.8	50.9	45.2	56.0
Cumberland (1)	34.7	28.0	41.9	52.8	62.9	67.2	73.6	69.2	64.0	49.5	41.8	43.2	52.4
Cumberland (2)	......	......	......	......	......	68.6	......	......	......	53.6	46.6	46.1	......
Fallston	35.8	27.7	40.7	[53.0]	62.7	[68.0]	73.5	[70.0]	63.3	49.6	44.3	42.2	[52.6]
Fort McHenry	37.6	31.6	43.9	55.0	64.6	70.4	74.5	72.2	66.1	53.3	47.7	45.0	55.2
Frederick	b37.2	g28.9	41.5	55.5	62.4	65.7	75.8	71.9	65.0	55.8	45.3	44.4	54.1
Gaithersburgh	32.8	25.6	37.5	48.1	58.6	66.2	71.4	68.1	60.6	47.1	40.8	38.8	49.6

Galena	*36.5*	*29.6*	*41.8*	*54.6*	*65.2*	*73.8*	*75.8*	*72.6*	*65.5*	*52.7*	*47.5*	*43.6*	54.9
Gambrill's	.....	.....	.....	.....	.....	.....	78.0	73.8	64.6	52.0	45.4	42.8	.....
Jewell	38.2	30.0	42.4	55.0	66.6	72.8	76.8	72.9	66.7	53.6	47.6	45.7	55.7
McDonogh	36.2	28.0	41.4	52.7	64.1	72.8	77.0	70.6	63.3	50.9	44.7	43.4	53.8
Mount St. Mary's	35.4	27.7	44.2	52.6	63.5	[70.0]	[76.0]	[72.0]	64.0	50.2	43.9	42.2	[53.5]
Woodstock	35.8	28.8	41.5	53.3	63.5	70.6	74.2	69.3	[65.5]	50.8	44.4	42.7	[53.4]
Massachusetts:													
Amherst (1)	32.3	23.2	37.1	48.8	60.8	67.2	68.8	65.1	61.0	48.2	42.2	35.7	49.2
Amherst (2)	30.3	20.8	36.0	47.4	59.6	66.3	68.1	64.4	60.9	45.2	40.6	33.5	47.8
Amherst (3)	[29.0]	[20.0]	37.9	50.8	61.4	67.7	69.5	65.6	61.9	46.5	41.0	35.0	[48.9]
Beverly Farms	30.6	.....	33.4	.....	.....	.....	.....	62.9	59.3	.....	.....	.....	.....
Blue Hill (summit)	31.6	22.2	34.4	44.8	57.6	65.0	66.1	64.2	59.7	45.7	41.0	35.1	47.3
Blue Hill (base)	33.0	23.9	36.2	47.4	59.4	66.5	67.8	65.2	61.8	47.3	43.1	36.6	49.0
Blue Hill (valley)	32.8	23.9	36.6	46.4	59.3	67.5	68.6	65.6	62.0	47.1	42.1	35.8	49.0
Boston	35.8	26.0	38.2	47.8	60.3	69.2	69.4	67.4	62.8	48.5	44.6	38.0	50.7
Brewster	35.8	27.6	36.7	46.3	58.0	67.8	69.6	68.4	63.8	50.2	45.4	39.5	50.8
Cambridge (1)	32.2	23.0	36.4	49.6	59.7	68.1	69.2	66.2	62.2	47.8	43.3	34.6	49.4
Cambridge (2)	33.3	23.7	36.6	47.6	60.7	69.9	70.9	67.6	63.2	46.8	42.8	35.8	49.9
Chestnut Hill	33.0	25.0	37.0	47.4	60.6	68.4	67.0	67.0	62.2	47.8	43.1	36.3	49.6
Cotuit	33.8	25.6	35.8	45.0	56.6	66.6	68.7	68.4	63.1	49.9	44.2	37.6	49.6
Deerfield (1)	29.5	20.0	36.2	48.2	59.9	.....	.....	.....	.....	.....	.....	.....	.....
Deerfield (2)	29.7	21.0	36.9	48.9	61.9	69.5	70.4	66.4	63.2	46.0	40.6	32.6	48.9
Dudley	29.6	21.4	34.7	47.6	59.9	68.7	68.7	66.2	61.3	45.6	40.8	34.0	48.2
Fall River (1)	35.4	25.0	35.5	49.2	57.8	65.8	68.5	67.1	62.6	48.8	44.0	39.1	49.9
Fall River (2)	34.4	24.0	37.0	46.5	.....	.....	69.9	.....	.....	49.8	44.9	37.3	.....
Fitchburg (1)	29.9	20.8	34.8	46.1	60.1	67.5	68.2	64.5	60.2	44.5	39.5	32.9	47.4
Fitchburg (2)	30.3	20.9	36.0	47.4	60.4	67.0	68.4	65.1	60.9	46.1	40.9	33.8	48.1
Fort Warren	34.9	26.3	38.8	46.0	60.0	66.7	68.1	65.0	60.0	47.3	41.1	34.6	49.1
Framingham	32.6	24.2	37.3	47.8	61.1	69.0	70.4	66.8	62.4	47.6	43.4	36.7	49.9
Gilbertville	30.3	20.2	35.8	47.5	60.6	67.8	68.4	64.5	61.1	45.7	40.3	33.0	47.9
Groton	31.0	22.6	36.7	48.7	61.2	68.2	69.4	66.3	62.0	47.0	41.6	34.6	49.1
Heath	26.9	18.6	34.2	45.0	6[illegible].5	69.2	72.5	69.3	62.8	46.5	37.8	28.4	47.6
Holyoke	33.2	25.0	39.2	50.7	63.9	70.4	72.5	70.1	64.0	48.0	42.6	35.8	51.3
Lake Cochituate	32.0	24.4	36.8	47.1	60.8	68.0	69.4	65.7	61.4	46.5	41.8	34.9	49.1
Lawrence	31.4	22.3	36.0	48.7	61.9	69.2	70.7	68.0	62.7	46.8	41.1	33.4	49.4
Leicester	29.4	18.9	33.0	43.6	57.3	65.6	66.6	64.2	59.1	44.5	39.6	32.8	46.2
Long Plain	[36.0]	[27.0]	35.4	46.6	59.3	69.4	70.6	69.6	64.6	48.8	44.6	36.8	[50.7]
Lowell (1)	[30.0]	[23.5]	32.2	44.1	60.9	69.4	70.9	68.2	62.9	47.8	42.5	34.9	[48.9]
Lowell (2)	31.1	22.7	36.3	47.6	60.1	68.2	69.2	66.3	62.2	46.4	42.0	34.2	48.9
Lowell (3)	31.0	22.4	35.8	47.8	60.4	68.2	69.8	66.4	62.4	46.5	41.7	33.8	48.8

* Minimum thermometer reported out of order during April and May. Readings generally too low and mean consequently from 2 to 4 degrees too low.

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Massachusetts—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Ludlow	29.5	20.5	34.4	45.9	58.2	64.6	66.6	63.8	60.2	45.0	42.6	36.2	47.3
Lynn	33.2	23.7	36.2	46.2	57.6	66.7	67.6	65.2	61.0	46.6	43.5	35.9	48.6
Mansfield	31.6	23.9	36.1	46.1	59.4	67.8	69.6	66.2	61.8	46.7	41.2	35.0	48.8
Middleborough	33.0	24.8	36.3	46.4	58.2	66.4	68.5	66.2	62.2	48.2	42.7	36.2	49.1
Milton	33.7	26.0	37.2	46.3	58.8	66.5	67.2	64.4	60.6	47.1	43.3	37.4	49.0
Monson	[33.5]	[22.5]	35.2	47.6	60.2	66.6	68.0	64.4	60.4	46.6	38.9	33.4	[48.1]
Nahant	......	......	......	......	......	63.2	65.6	61.6	61.6	g45.8	43.5	36.4	......
Nantucket	37.7	27.9	36.4	44.4	54.2	63.6	67.0	67.4	63.0	52.0	46.1	39.0	49.9
Natick	34.0	24.7	37.6	48.9	61.9	69.1	70.0	67.2	62.7	48.4	43.6	36.8	50.4
New Bedford (1)	33.7	25.2	35.6	45.4	56.1	64.4	67.3	66.0	61.5	48.6	43.5	37.7	48.8
New Bedford (2)	31.3	25.7	37.1	46.6	57.1	66.0	69.0	67.2	62.9	49.6	45.2	38.8	49.7
Newburyport	32.7	24.4	36.7	46.5	58.9	67.5	68.1	65.3	61.2	46.9	42.1	35.3	48.8
Northampton	30.8	21.6	37.2	49.2	61.9	69.2	72.7	69.4	64.6	47.1	41.7	34.1	50.0
North Billerica	32.6	24.0	35.6	48.3	59.4	71.2	69.5	67.2	62.8	46.6	42.6	34.8	49.6
Plymouth	35.8	27.9	38.6	48.4	60.7	70.8	69.0	68.2	64.5	51.9	45.6	39.8	51.8
Princeton	27.3	19.3	34.2	44.6	57.2	65.0	66.2	64.0	59.3	45.1	38.8	31.9	46.1
Provincetown	35.7	27.4	36.6	[45.0]	[58.0]	66.9	69.0	67.8	63.8	50.3	46.1	[39.0]	[50.5]
Rowe	26.0	17.0	31.3	43.5	......	......	......	......	......	......	......	......	......
Royalston	35.0	24.3	39.3	49.6	61.6	68.4	69.8	66.4	63.6	47.9	43.6	37.0	50.5
Salem	32.9	25.0	[38.0]	48.4	58.1	69.5	70.5	67.6	64.0	48.7	42.4	36.8	[50.2]
Somerset	34.2	25.3	36.9	49.2	62.0	71.1	73.3	70.5	65.8	50.9	45.2	39.0	52.0
Springfield National Armory	31.1	22.0	37.4	49.7	63.0	70.0	71.4	68.6	63.6	47.6	42.4	34.8	50.1
Taunton (1)	34.5	25.6	36.8	47.7	59.2	67.5	68.6	67.1	62.0	49.2	44.5	38.2	50.1
Taunton (2)	33.4	25.0	36.7	47.8	59.6	67.4	69.0	66.9	62.4	48.2	43.6	36.8	49.7
Taunton (3)	33.3	24.8	35.4	46.6	59.0	61.6	69.1	66.8	[62.5]	48.3	44.3	36.9	[49.3]
Wellesley	33.0	24.8	37.6	48.5	61.6	68.8	69.0	66.0	62.6	48.0	42.6	35.6	49.8
Westborough	33.4	24.2	37.6	49.5	64.0	69.5	72.7	68.9	64.4	48.8	43.6	36.3	51.1
Williamstown	j26.1	19.3	34.0	47.2	59.1	64.9	67.9	63.6	59.7	43.7	39.6	33.2	46.5
Worcester (1)	30.2	20.6	35.8	47.1	60.1	69.5	69.6	65.2	64.5	45.5	41.0	34.3	48.6
Worcester (2)	32.1	22.8	37.0	47.8	61.0	68.2	79.0	[66.5]	61.8	[49.0]	42.8	36.4	[50.4]
Michigan:													
Adrian	25.2	16.5	33.3	44.4	56.2	63.2	69.9	68.0	61.3	45.4	38.2	38.2	46.6
Albion	30.0	22.1	36.0	[46.0]	e54.8	64.2	74.2	69.1	61.4	44.9	37.9	38.3	[48.2]

Alma	*24.5*	*13.5*	*32.0*	*42.3*	*51.9*	*59.3*	*66.0*	*68.0*	*60.4*	42.4	*37.0*	*36.2*	44.5
Alpena	24.4	12.7	31.4	40.4	49.6	55.6	64.8	63.7	57.2	40.5	34.9	31.3	42.2
Ann Arbor	*[28.5]*	*[18.5]*	*[37.0]*	*44.6*	*56.1*	*62.8*	*70.5*	68.1	61.5	45.0	37.3	37.4	[47.3]
Atlantic Mine	19.8	8.5	27.8	37.1	48.0	57.3	65.1	64.0	55.7	33.2	27.0	24.8	39.0
Bear Lake	27.9	14.7	30.9	41.7	48.4	57.4	65.0	65.5	60.1	39.0	29.9	32.4	42.7
Bell Branch	26.7	18.0	34.2	44.8	55.6	64.7	71.8	67.1	61.6	44.2	37.3	33.9	46.7
Benton Harbor	28.2	19.8	34.4	44.0	*m* 59.8	[67.0]	[72.0]	[69.0]	66.2	49.0	42.4	42.9	[49.6]
Benzonia	24.6	15.5	30.8	41.2	51.0	57.2	65.7	......	......	......	......	......	......
Berlin	27.5	16.2	34.8	[45.0]	56.3	65.0	71.3	69.3	[62.5]	45.6	38.6	36.5	[47.4]
Berrien Springs	[29.0]	21.4	36.7	48.0	57.6	66.6	71.6	67.5	62.0	44.7	38.5	39.4	[48.6]
Big Rapids	24.3	13.7	32.6	43.0	53.4	60.0	67.6	66.4	59.6	42.2	36.9	32.6	44.4
Birmingham	27.0	17.5	34.7	44.8	56.4	62.8	69.8	70.1	59.9	44.4	39.5	37.3	47.0
Bronson	27.1	16.7	31.4	40.9	52.2	60.7	67.8	64.2	56.8	39.0	34.6	35.4	43.9
Buchanan	27.6	20.6	35.3	45.0	53.8	61.5	68.7	67.2	61.7	46.1	37.9	39.4	47.1
Calumet	20.2	8.5	28.3	36.3	46.5	55.5	63.4	61.6	54.6	36.7	30.6	25.9	39.0
Cassopolis	28.5	20.5	36.4	46.9	57.2	64.6	70.2	68.6	63.0	44.3	37.7	38.5	48.0
Charlevoix	[24.0]	13.5	30.6	39.8	51.7	56.2	64.7	66.4	59.6	42.7	36.3	33.0	[43.2]
Chase	23.3	12.1	29.7	[42.0]	49.5	55.8	63.5	65.1	57.6	41.2	35.2	32.4	[42.3]
Chelsea	28.2	18.6	35.2	44.6	56.8	63.0	69.5	67.3	[61.0]	45.9	41.1	39.2	[47.5]
Colon	26.2	13.7	33.7	43.5	55.4	61.8	68.1	65.0	57.1	40.2	35.5	36.3	44.7
Columbiaville	......	......	......	......	......	......	......	73.2	63.1	44.9	37.6	36.0	......
Concord	26.8	18.1	34.7	46.1	56.6	64.6	71.4	68.5	61.2	45.2	37.4	37.6	47.4
Deer Lake	26.1	16.5	34.4	42.9	54.9	63.7	71.3	70.1	60.4	40.3	33.8	33.1	45.6
Detroit	29.8	19.4	37.4	46.3	57.3	63.8	71.3	69.9	62.7	46.9	40.2	39.2	48.7
East Saginaw	26.7	16.4	34.5	45.1	......	......	......	......	......	......	......	......	......
East Tawas	26.1	15.4	33.0	43.8	52.5	58.4	[67.0]	[64.0]	58.5	42.6	36.7	34.3	[44.4]
Eden	28.6	18.8	37.0	46.6	57.2	63.6	71.0	68.7	[61.5]	[45.0]	[38.0]	37.1	[47.8]
Escanaba	23.4	12.8	31.6	40.4	48.6	57.5	66.6	65.4	59.6	41.0	33.0	29.6	42.5
Evart	[24.0]	[12.0]	[33.5]	44.8	54.2	58.9	67.2	63.4	52.2	36.4	32.9	29.6	[42.4]
Flint	25.9	15.6	33.3	44.8	55.4	62.6	69.3	67.8	60.6	43.5	37.3	35.2	45.9
Fort Brady	21.0	7.5	28.8	40.1	*k*49.2	56.3	62.2	61.2	56.8	38.9	32.7	27.8	40.2
Fort Mackinac	23.8	10.1	30.0	40.5	49.4	54.0	64.1	62.5	57.1	41.1	33.6	30.8	41.4
Fort Wayne	[29.0]	19.1	36.8	46.3	56.7	63.9	71.4	69.3	62.2	45.9	39.8	38.6	[48.2]
Fremont	25.6	15.6	34.8	[43.0]	55.0	61.9	70.8	67.6	60.3	41.6	35.6	34.7	[45.5]
Gaylord	......	......	27.2	......	......	......	65.4	62.2	......	......	30.1	28.2	......
Gladwin	22.4	11.6	37.0	45.6	54.6	[60.0]	[69.0]	[66.0]	58.6	41.6	35.4	32.6	[44.5]
Grand Haven	29.0	19.4	35.4	43.4	52.3	59.0	67.0	66.4	61.2	44.2	38.8	37.4	46.1
Grand Rapids	29.0	18.6	37.4	45.7	56.4	61.7	69.7	65.8	61.5	43.5	37.6	37.2	47.0
Grayling	[25.0]	[14.0]	[33.0]	47.1	55.5	58.8	67.2	62.4	57.1	37.6	37.0	31.5	[43.8]
Gulliver Lake	22.1	11.2	30.4	38.9	47.1	[57.0]	64.4	62.7	[59.0]	39.7	32.2	[29.0]	[41.1]
Hanover	28.2	19.8	35.0	45.5	56.2	63.2	69.9	67.2	61.7	46.4	40.8	39.5	47.8

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Michigan—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Hart	26.5	16.4	33.3	44.2	54.2	60.8	72.3	67.3	64.4	45.0	41.7	37.0	46.9
Harrisville	26.1	14.0	32.2	41.1	49.6	56.6	66.6	63.1	56.4	40.2	34.9	31.8	42.7
Hastings	28.8	19.6	35.0	44.6	56.6	63.5	70.5	67.9	61.2	43.7	38.1	38.0	47.3
Highland Station	26.5	15.2	32.6	44.0	55.6	64.0	73.8	70.3	60.9	43.2	37.4	35.8	46.6
Hillman	23.8	10.3	30.1	41.4	51.2	57.6	66.7	63.5	57.2	41.9	32.9	30.6	42.3
Hillsdale	[27.0]	18.3	34.3	[46.0]	54.4	65.2	71.1	68.3	61.7	46.5	38.4	39.3	[47.5]
Hudson	27.3	19.7	36.6	47.1	56.7	63.4	68.4	68.8	58.4	43.0	35.6	37.0	46.5
Ionia	27.3	14.4	31.3	42.5	53.0	[61.0]	70.2	68.6	62.1	[42.0]	[36.0]	39.4	[45.6]
Ivan	......	......	......	......	53.2	59.5	67.0	64.7	53.8	37.9	32.3	30.5	......
Jeddo	29.5	78.9	35.8	47.3	[54.0]	67.1	75.6	74.1	65.4	41.6	37.7	34.6	[48.7]
Kalamazoo	28.8	19.7	36.3	46.8	56.5	63.4	70.3	68.7	60.9	56.2	39.0	40.2	48.9
Lansing (1)	27.6	17.2	37.0	46.0	56.4	62.6	70.4	68.4	61.4	44.4	37.5	37.0	47.2
Lansing (2)	28.8	18.9	36.5	46.6	56.8	62.9	70.0	68.0	60.9	43.8	37.7	37.2	47.3
Lathrop	19.0	9.2	29.5	39.7	50.0	59.5	67.5	63.1	54.2	39.2	29.6	27.3	40.6
Madison	25.5	16.2	33.4	43.6	56.3	63.4	72.2	65.3	58.0	42.5	38.4	38.1	46.1
Manistee	26.6	17.4	33.1	42.2	50.8	56.4	65.2	65.6	60.1	42.1	36.6	34.8	44.2
Marquette	23.3	11.8	31.1	39.6	48.2	55.6	61.9	64.2	58.1	40.6	33.5	28.7	41.6
Marshall	30.3	22.1	38.4	48.6	58.5	64.5	71.8	68.6	62.2	44.0	37.6	37.6	48.7
May	25.2	15.1	31.5	43.0	54.4	61.2	67.4	[67.0]	c60.4	45.2	[38.0]	3 .6	[45.3]
Mio	22.3	10.2	29.0	[42.0]	53.2	58.1	66.9	63.5	[58.0]	38.4	35.0	29.7	[42.2]
Montague	27.2	17.0	32.2	41.4	51.0	56.7	65.0	64.3	60.9	45.3	37.1	35.4	44.5
Mottville	27.9	18.1	37.6	48.4	57.2	64.0	67.9	67.3	62.0	46.2	37.8	38.8	47.8
North Adams	......	......	......	44.4	54.8	61.2	69.2	67.6	57.4	45.1	37.8	......	......
North Marshall	29.0	18.1	36.0	43.6	54.9	61.4	68.8	68.7	62.0	42.8	33.7	35.3	46.2
Olivet	27.4	18.0	34.6	44.8	56.0	62.6	67.8	65.6	59.6	43.2	36.0	36.1	46.0
Otsego	......	......	......	......	......	......	68.7	67.2	60.7	41.5	37.0	36.3	......
Ovid	25.6	15.4	32.4	43.6	55.2	61.3	70.1	65.8	60.6	43.4	37.3	35.6	45.5
Paw Paw	27.1	18.5	34.3	44.6	55.1	62.5	72.0	62.6	63.6	46.5	38.3	38.4	47.0
Petersburgh	27.6	17.9	34.3	44.8	57.1	63.4	70.4	......	......	......	......	......	......
Pontiac	29.6	19.9	36.6	46.9	58.0	63.8	70.6	68.4	61.4	46.0	39.7	37.1	48.2
Port Huron	28.4	16.6	34.2	43.0	54.1	60.2	68.2	67.4	61.0	44.6	38.6	36.6	46.1
Pulaski	28.4	18.9	34.2	45.0	56.2	63.9	72.5	68.0	60.0	42.4	37.0	36.7	46.9
Rawsonville	[30.0]	[19.0]	[37.0]	47.4	57.9	64.7	70.0	68.1	61.4	46.9	37.0	39.1	[48.2]

Romeo	*26.8*	*18.2*	......	*43.5*	*55.8*	......	......	......	*61.9*	*45.1*	*38.7*	*35.2*	......
Roscommon	*23.1*	*12.0*	*31.1*	*42.3*	*52.4*	*59.0*	*65.3*	*63.0*	56.4	35.5	31.4	30.6	41.8
St. Ignace	*[23.0]*	*[10.0]*	29.5	38.6	48.5	54.8	*62.0*	*62.3*	56.5	39.6	[32.5]	29.6	[40.6]
St. John's	27.2	16.1	33.3	43.3	54.9	60.8	71.1	69.1	62.5	42.0	38.2	36.7	46.3
Sand Beach	27.6	16.5	32.3	41.6	51.8	57.2	69.0	66.4	62.0	43.8	[36.0]	34.6	[44.9]
Sault de Ste. Marie	20.4	7.0	28.7	39.8	48.7	55.4	62.2	61.2	56.6	39.0	32.8	27.6	40.0
Standish	[22.5]	[15.5]	[33.5]	45.3	54.9	64.5	64.0	69.5	56.1	42.7	37.9	30.8	[44.8]
Stanton	[25.0]	14.3	33.0	43.6	54.3	60.6	68.4	68.0	60.5	43.1	36.7	37.9	[45.4]
Thornville	29.0	18.3	36.2	46.2	57.7	65.5	71.7	69.9	62.6	45.6	38.9	38.0	48.3
Traverse City (1)	26.5	[13.0]	33.4	43.4	51.5	59.8	64.5	65.9	60.9	41.7	35.2	33.2	[44.1]
Traverse City (2)	27.0	16.5	33.0	43.0	50.7	59.8	65.4	66.8	60.9	41.7	35.2	33.2	44.4
Vandalia	26.3	16.1	32.3	42.6	53.8	61.4	68.1	65.0	58.2	*n*42.5	36.4	38.0	45.1
Washington	24.8	14.3	31.4	42.2	53.8	61.4	67.8	67.2	60.8	45.0	38.4	35.8	45.2
West Branch	22.4	[14.0]	30.5	[40.0]	50.5	57.9	67.0	64.7	57.6	40.8	35.2	32.7	[42.8]
Williamston	30.6	19.9	37.8	45.1	58.0	63.5	70.3	69.5	61.2	46.7	39.8	36.5	48.2
Ypsilanti (1)	27.6	19.0	35.0	44.8	56.2	63.6	70.4	67.1	59.3	43.2	35.9	35.4	46.8
Ypsilanti (2)	29.9	21.5	37.9	46.9	*a*58.4	64.0	70.7	67.2	60.8	46.1	39.3	38.6	48.4
Minnesota:													
Brainerd	......	......	31.9	47.6	56.8	64.8	70.4	71.8	54.2	44.6	......	......	......
Crookston	......	......	......	......	......	......	......	71.9	53.8	40.2	25.1	17.9	......
Duluth	19.6	8.8	33.1	40.8	48.8	57.5	64.0	64.8	54.8	42.3	31.0	25.6	40.9
Farmington	19.2	10.0	36.6	48.4	57.6	65.9	71.9	70.0	58.8	44.6	29.0	29.7	45.1
Fort Snelling	18.3	5.9	36.0	49.6	56.1	64.6	71.5	70.5	60.0	46.4	30.2	29.1	44.8
Grand Meadow	19.0	11.2	34.7	44.8	52.3	65.2	70.9	68.0	58.2	42.2	27.0	29.2	43.6
Lake Winibigoshish Dam	11.6	3.1	30.6	42.8	52.6	63.4	66.9	65.7	52.6	40.0	24.6	18.3	39.4
Leech Lake Dam	[11.6]	[1.0]	30.1	42.6	[52.0]	61.6	63.4	64.8	51.8	38.6	24.3	19.1	[38.4]
Le Sueur	19.8	*d*11.3	35.8	*d*49.6	*d*57.2	67.5	*d*73.1	*d*71.5	*d*58.6	43.2	28.1	29.6	45.4
Mankato	19.8	13.4	36.9	49.3	55.9	65.4	70.8	70.8	59.1	45.8	29.6	31.7	45.7
Medford	17.6	8.8	34.6	46.0	54.6	64.0	68.6	68.9	......	......	......	......	......
Minneapolis	18.1	10.4	34.9	48.4	56.0	65.9	71.0	69.9	58.2	43.8	28.2	27.5	44.4
Montevideo	......	......	......	......	......	......	......	71.4	57.3	46.1	29.0	25.8	......
Moorhead	9.8	0.5	32.6	45.2	52.0	63.7	66.8	68.6	54.3	43.6	24.8	20.0	40.2
Morris	11.9	4.9	32.7	46.8	54.6	63.8	68.3	69.0	56.0	43.6	26.1	23.6	41.8
Northfield	19.5	11.6	35.9	48.0	55.9	60.2	72.2	70.3	58.5	43.3	28.3	29.7	44.4
Owatonna	......	......	......	......	......	......	69.4	68.4	57.6	42.7	27.5	30.0	......
Pine River Dam	12.2	1.4	29.3	43.6	53.6	64.1	72.7	67.4	53.1	36.2	23.6	18.9	39.7
Pokegama Falls Dam	11.2	[1.4]	29.2	39.2	46.3	58.8	63.0	63.2	50.4	37.9	23.0	18.5	[36.8]
Red Wing	20.4	11.1	35.4	47.7	55.9	63.7	70.5	69.1	57.8	43.1	31.0	29.8	44.6
Rolling Green	15.5	9.7	35.2	47.4	56.8	64.6	71.1	71.7	56.3	44.1	27.6	29.4	44.1
St. Paul	20.2	10.2	36.6	48.5	56.0	64.3	71.2	70.5	59.2	45.1	29.5	28.6	45.0
St. Vincent	6.7	-3.0	30.4	42.8	50.4	62.8	65.0	65.5	51.6	40.4	23.9	10.6	37.3

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Mississippi:	°	°	°	°	°	°	°	°	°	°	°	°	°
Aberdeen	......	......	......	......	64.5	72.6	77.7	75.4	68.8	58.5	48.9	......	......
Agricultural College	45.2	45.9	54.9	64.9	69.2	[74.0]	81.2	77.6	72.1	62.2	49.8	60.1	[63.1]
Batesville	45.5	43.3	50.9	63.1	70.4	76.3	81.8	77.2	71.4	60.0	50.4	60.0	62.5
Booneville	......	......	......	63.6	68.2	74.2	79.6	......	......	......	49.4	59.8	......
Brookhaven	......	......	......	......	70.6	78.0	82.1	78.8	76.0	65.7	53.2	61.6	......
Columbus	......	......	......	......	72.6	79.7	84.4	80.9	74.6	62.4	51.8	59.3	......
Corinth	......	......	......	......	64.2	61.5	77.2	75.0	70.2	56.8	49.2	55.4	......
Edwards	[48.0]	49.0	56.8	[67.0]	71.4	78.3	82.4	80.2	76.2	64.6	53.6	60.6	[65.7]
Fayette	......	......	......	......	......	j79.1	82.4	79.0	75.5	66.2	53.5	63.3	......
Greenville	[45.0]	48.5	55.7	65.5	69.5	75.4	80.6	78.0	72.6	62.3	51.1	59.3	[63.6]
Hazlehurst	......	......	......	......	f73.5	78.4	81.0	78.8	75.6	65.4	52.7	......	......
Hernando	......	......	......	......	73.9	76.7	e81.6	76.8	72.4	60.2	46.3	......	......
Holly Springs (1)	[44.0]	42.0	[48.0]	[64.0]	69.2	74.0	80.2	78.9	73.6	61.8	45.6	58.6	[61.7]
Holly Springs (2)	......	......	......	......	70.1	74.7	81.0	77.6	70.9	60.7	47.6	......	......
Jackson	......	......	......	......	70.7	77.6	81.4	77.6	75.2	f61.0	52.8	52.5	......
Kosciusko	......	......	......	......	69.4	74.1	77.2	76.5	75.6	63.7	50.4	60.3	......
Lake	......	......	......	......	68.8	76.2	80.5	77.0	73.0	61.8	51.7	58.0	......
Lamar	44.8	44.4	56.3	......	70.8	74.3	82.4	......	......	......	......	60.3	......
Loch Leven	49.5	51.7	57.8	69.8	71.7	[75.0]	83.2	80.1	75.7	65.1	52.6	[61.0]	[66.1]
Logtown	52.2	53.0	59.6	69.1	72.2	77.0	81.6	79.2	73.9	68.0	56.5	61.6	67.0
Louisville	44.4	e51.2	56.6	66.2	70.7	77.0	81.2	79.1	74.2	63.8	52.3	58.8	64.6
Macon (1)	......	......	......	......	70.6	77.4	82.8	79.2	72.4	66.3	54.4	......	......
Macon (2)	e41.2	......	e52.6	f65.6	c70.2	b75.6	80.2	......	......	......	44.9	......	......
Meridian	......	......	......	......	71.3	77.8	82.8	f80.6	......	......	......	......	......
Natchez	......	......	......	......	72.8	79.0	82.0	78.4	75.1	64.8	52.3	......	......
Okolona	......	......	......	......	71.2	76.8	81.5	78.0	72.4	61.8	50.2	......	......
Palo Alto	44.3	44.3	......	......	......	......	......	......	......	......	50.7	59.0	......
Pearlington	[52.0]	53.6	59.6	69.1	73.7	77.8	83.1	79.4	77.6	67.4	56.5	61.6	[67.6]
Pontotoc	42.1	41.2	53.2	63.0	65.4	73.8	76.9	74.0	69.4	58.2	49.4	58.2	60.4
Port Gibson	......	......	......	......	m71.4	77.0	81.5	77.9	74.6	63.6	51.6	......	......
Rienzi	[44.5]	43.5	j56.8	63.5	70.1	74.2	79.8	77.2	72.6	58.2	51.0	59.8	[62.6]
Summit	j47.2	e47.4	k56.0	67.2	68.6	75.4	78.0	76.0	[76.0]	63.6	50.8	[62.0]	[64.0]
University	43.8	43.1	53.6	63.4	69.5	74.0	80.2	77.4	71.0	61.0	49.4	58.8	62.1

Vicksburg	*49.3*	*49.4*	*57.6*	*67.3*	*71.2*	*77.6*	*81.3*	*79.6*	*75.5*	*65.2*	*53.2*	*63.6*	*65.9*
Water Valley	*[44.0]*	*42.8*	*55.7*	*66.0*	*72.0*	*78.5*	*83.4*	*80.6*	*73.6*	*61.9*	*51.2*	*61.9*	*[64.3]*
Waynesborough (1)	......	......	......	......	69.3	75.0	82.2	78.6	74.2	62.7	53.7	58.4	......
Waynesborough (2)	[45.0]	44.8	54.8	64.2	68.8	75.0	79.3	77.7	73.0	62.0	52.0	58.4	[62.9]
Missouri:													
Columbia	......	......	......	......	......	......	......	......	64.8	53.4	41.3	49.3	......
Conception	25.0	[25.0]	43.0	53.2	61.8	69.3	79.4	72.3	66.1	51.5	37.6	42.5	[52.2]
Craig	27.9	24.8	39.2	......	......	......	......	......	......	......	42.6	45.4	......
Excelsior Springs	25.6	24.3	40.8	52.2	65.0	70.5	76.0	71.2	61.6	50.9	35.7	43.2	51.4
Fayette	31.8	29.4	45.4	56.2	63.8	......	......	......	......	51.7	39.4	47.1	......
Fox Creek	33.7	30.5	45.8	57.8	62.0	69.7	76.7	72.5	63.8	52.5	38.8	47.6	54.3
Frankford	[31.0]	27.8	38.8	50.8	58.4	66.8	73.3	67.2	59.8	46.0	36.0	40.4	[49.7]
Glasgow	30.2	27.9	41.2	55.1	62.2	68.8	75.2	73.0	63.8	52.1	38.4	46.1	52.8
Grand Pass	29.4	27.3	43.6	54.9	63.1	69.4	75.4	72.1	63.5	52.7	38.6	45.7	53.0
Harrisonville	28.8	27.1	42.9	54.3	63.6	70.5	75.0	71.2	66.8	51.9	36.8	46.0	52.9
Ironton	39.5	33.6	48.1	60.0	65.0	70.4	76.8	73.0	66.4	54.5	42.8	52.2	56.9
Jefferson Barracks	29.0	23.2	38.6	54.9	58.2	69.5	76.8	74.0	66.6	56.4	42.8	47.7	53.1
Kansas City (1)	31.2	28.5	45.4	55.5	63.3	70.8	77.0	74.3	64.5	54.8	40.0	46.4	54.3
Kansas City (2)	31.3	28.5	46.3	56.6	64.8	71.6	78.2	75.2	65.7	54.7	39.1	46.0	54.8
Kirksville	28.4	24.6	42.6	53.8	61.8	68.4	75.7	67.3	59.4	[50.5]	[38.0]	40.9	[51.0]
Lamonte	32.3	29.6	46.2	56.8	[63.5]	77.9	79.3	72.2	69.2	62.2	42.8	48.2	[56.7]
Miami	30.7	27.4	44.6	55.1	63.8	70.5	[80.0]	76.2	65.9	53.1	35.2	46.1	[54.0]
New Frankfort	29.9	27.8	40.9	51.7	67.4	69.6	78.4	75.9	62.2	55.0	38.0	46.3	53.6
New Haven	40.7	37.9	......	......	......	......	80.1	......	70.0	59.7	42.0	51.1	......
Oak Ridge	37.0	......	47.4	......	......	......	......	75.0	61.2	......	43.0	49.8	......
Oregon	26.9	25.4	43.8	54.8	63.1	70.2	73.5	70.2	63.7	52.7	[42.0]	42.9	[52.4]
Ozark	34.4	32.5	45.7	57.1	64.3	76.7	79.0	73.4	66.2	55.6	41.4	51.6	56.5
Princeton	27.9	26.7	45.3	55.1	66.2	76.6	81.4	78.7	65.9	54.0	39.8	44.6	55.2
St. Charles	34.1	30.2	44.9	......	62.0	......	......	75.0	63.5	54.1	......	......	......
St. Louis (1)	34.8	31.4	46.6	57.9	63.8	70.6	77.8	75.4	67.0	55.1	41.4	49.8	56.0
St. Louis (2)	34.1	30.8	46.5	57.7	63.8	70.8	78.1	74.7	67.1	54.9	40.6	49.4	55.7
Sedalia	35.6	32.8	48.1	56.7	63.7	73.5	80.8	77.7	66.0	56.0	41.5	49.4	56.8
Springfield (1)	36.7	33.9	47.1	59.0	64.3	70.6	......	......	......	......	......	......	......
Springfield (2)	35.5	32.6	46.2	57.2	62.8	69.0	76.9	73.0	64.4	56.6	41.0	51.8	55.6
Steelville	......	......	......	......	......	64.0	76.1	......	60.8	47.7	41.6	52.5	......
Warrensburgh	28.5	......	......	53.7	......	69.4	......	73.1	63.3	52.0	36.7	45.1	......
Warrenton	35.2	25.4	......	......	......	......	......	......	......	51.0	39.9	45.6	......
Willow Springs	[38.0]	31.2	45.6	55.8	67.1	69.5	[77.0]	77.1	67.6	57.2	43.0	52.4	[56.8]
Montana:													
Camp Poplar River	9.8	17.3	35.4	49.5	52.0	63.9	67.1	69.8	53.5	47.0	24.3	9.8	41.6
Fort Assinniboine (1)	14.8	21.8	38.3	50.4	52.0	62.6	64.9	66.2	53.1	49.0	29.0	18.4	43.4

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Montana—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Fort Assinniboine (2)	14.8	22.8	39.3	50.6	52.2	62.6	66.6	67.1	56.5	50.6	32.2	20.6	44.7
Fort Custer (1)	16.1	21.4	40.6	50.6	52.6	61.8	69.8	70.5	55.4	50.8	32.8	27.9	46.1
Fort Custer (2)	16.0	21.5	40.8	50.6	52.6	64.2	69.3	70.5	55.4	50.8	32.6	28.3	46.0
Fort Keogh	14.0	17.7	35.9	51.3	53.6	67.8	73.0	72.1	54.9	51.1	29.4	23.2	45.3
Fort Logan	......	......	......	......	48.4	59.2	62.0	61.7	49.3	43.9	25.0	16.0	......
Fort Maginnis	26.0	24.2	40.8	48.2	49.8	61.9	65.2	68.6	64.5	51.4	31.8	30.4	47.2
Fort Missoula	13.0	23.8	42.9	49.3	56.6	63.1	67.6	60.7	52.0	48.5	28.7	16.8	43.6
Fort Shaw	24.2	24.4	41.8	50.2	52.8	63.1	65.8	65.5	55.2	51.2	37.3	28.2	46.6
Glendive	......	......	......	......	52.0	59.4	62.3	69.4	55.8	51.6	27.4	24.0	......
Helena	16.7	25.2	39.1	49.2	53.2	63.4	66.8	67.2	55.2	50.7	31.4	22.6	45.1
Powder River	......	......	......	......	53.6	75.4	78.4	72.0	55.5	49.4	28.7	26.6	......
Sheldon	19.4	24.0	36.8	46.4	56.0	65.7	66.9	60.8	51.8	47.4	31.0	28.0	44.5
Virginia City	18.4	24.6	38.8	46.1	50.2	61.4	65.7	66.7	51.3	48.0	29.8	25.0	43.8
Nebraska:													
Alliance	......	......	......	......	......	......	......	......	c59.6	53.0	34.1	36.6	......
Ansley	23.6	22.8	38.8	48.7	58.2	68.0	71.2	73.4	59.8	49.3	32.2	34.2	48.4
Ashland	[24.0]	[23.0]	43.3	51.7	63.7	69.9	74.2	70.3	63.5	51.3	35.2	[39.5]	[50.8]
Bingham	......	......	......	......	......	......	c70.4	71.7	56.0	......	f28.4	32.1	......
Craig	......	......	......	h53.5	62.0	69.2	73.0	72.0	61.2	50.3	32.3	35.4	......
Creighton	18.5	16.9	34.9	49.2	56.4	67.2	71.0	70.4	57.5	45.2	28.3	31.1	45.6
Crete (1)	24.6	22.3	41.7	53.4	[61.0]	70.5	73.2	[72.5]	61.4	50.7	33.3	38.6	[50.3]
Crete (2)	25.7	23.9	42.6	54.0	61.0	68.4	74.2	72.4	63.0	51.6	35.6	39.9	51.0
Culbertson	23.4	28.7	44.0	f53.5	......	70.6	75.4	......	d59.1	......	......	......	......
David City	21.2	21.6	31.6	45.4	55.4	62.5	66.8	65.5	53.0	42.0	24.0	29.0	43.2
De Soto	22.6	22.0	41.3	51.2	61.4	68.9	73.8	72.4	62.1	50.1	33.2	37.0	49.7
Falls City	26.2	22.4	40.9	54.2	61.9	69.3	75.6	74.0	63.9	53.8	38.1	43.8	52.0
Fort Niobrara	15.4	19.6	39.0	48.9	51.6	64.8	71.2	75.6	58.0	51.6	28.1	31.6	46.3
Fort Robinson	26.2	27.1	43.0	50.3	53.4	64.6	70.5	70.8	58.3	51.9	32.4	38.0	48.9
Fort Sidney	22.7	23.7	39.7	50.0	54.6	65.6	72.4	73.1	59.7	48.4	32.9	36.2	48.3
Franklin	20.0	19.4	36.7	51.0	59.3	69.1	......	......	......	......	......	......	......
Fremont	21.9	21.9	40.8	53.7	61.9	70.2	74.4	73.2	65.3	50.5	33.1	37.4	50.2
Genoa	22.3	21.3	39.9	52.7	60.7	69.6	73.4	72.8	60.6	50.1	32.1	35.4	49.2
Gering	......	......	......	......	......	......	73.2	e74.0	60.7	51.3	33.6	37.9	......

Grand Island	....	....	....	....	....	....	....	....	*57.5*	*45.0*	*25.0*	*34.0*	....
Hay Springs	*20.7*	*18.6*	*37.3*	*47.3*	52.1	*64.1*	*70.2*	*70.3*	54.6	*46.9*	28.0	32.0	45.2
Howe	....	....	....	....	....	....	....	....	65.5	54.1	36.8	42.3	....
Kennedy	[24.0]	*f*20.7	39.5	49.8	55.9	67.2	71.0	72.7	58.9	50.5	36.1	39.1	[48.8]
Kimball	24.2	*j*27.4	[38.0]	[48.0]	*f*54.0	65.7	71.9	72.0	61.0	56.6	33.1	37.8	[49.1]
Lincoln	25.6	23.4	42.2	50.3	[60.0]	69.0	74.2	72.8	62.5	50.4	34.9	39.5	[50.4]
Lexington	....	....	....	51.6	....	....	....	....	....	42.3	33.6	30.7	....
Minden	21.1	25.1	41.7	54.2	58.8	70.2	74.8	73.8	[63.5]	49.4	32.2	37.0	[50.2]
Nebraska City	23.6	22.6	42.5	53.7	63.5	[71.0]	74.0	[73.0]	[64.0]	49.7	31.9	40.2	[51.1]
North Loup	22.5	22.1	37.6	51.5	56.7	69.6	72.1	70.5	58.1	50.0	31.4	35.1	48.1
North Platte	20.5	26.6	40.9	50.6	56.3	66.6	71.7	72.3	59.8	49.8	33.2	37.2	48.8
Oakdale	19.6	16.9	37.8	50.7	57.7	68.1	71.5	71.4	57.3	[45.0]	28.2	32.0	[46.4]
Omaha	24.0	23.0	42.5	54.0	62.5	69.5	74.8	74.0	63.6	52.2	35.3	39.4	51.2
Omaha Barracks	[24.0]	26.1	42.8	56.6	66.6	*f*72.4	[75.0]	*o*74.3	62.7	50.4	33.7	37.0	[51.8]
Palmer	20.5	20.3	36.8	49.2	57.7	66.4	76.0	68.5	[62.0]	45.6	30.5	35.6	[47.4]
Sargent	21.0	21.6	37.0	48.9	58.1	....	75.0	74.5	....	....	....	....	....
Stratton	....	....	40.9	51.8	58.4	67.7	78.8	....	....	....	....	....	....
Syracuse	24.9	24.1	42.7	54.2	63.7	70.9	74.0	71.2	64.7	51.9	35.5	40.0	51.5
Tecumseh	26.0	23.1	41.6	53.5	62.8	70.3	*g*75.2	75.8	64.1	54.0	*a*34.9	[41.0]	[51.9]
Valentine	24.6	24.8	44.0	51.8	54.6	65.6	71.6	73.0	58.4	49.8	31.5	35.6	48.8
Weeping Water	23.4	21.7	39.3	50.5	62.1	67.2	72.8	71.0	60.8	49.0	31.7	37.7	48.9
Weston	[24.0]	[23.0]	[42.5]	55.6	62.0	70.6	75.0	76.0	63.2	51.8	31.0	37.0	[51.0]
West Hill	20.4	19.3	38.8	52.1	60.6	70.5	74.3	74.1	[62.0]	51.3	30.8	35.3	[49.1]
Nevada:													
Austin	24.2	31.8	42.4	....	53.4	....	73.7	71.7	....	....	42.5	31.8	....
Battle Mountain	19.5	26.7	46.1	55.9	59.5	70.2	78.4	76.0	63.5	51.3	40.1	33.4	51.7
Belmont	....	....	....	....	52.4	66.8	72.6	69.1	62.0	46.6	36.6	27.2	....
Beowawe	16.6	25.0	48.0	56.3	62.7	76.4	82.0	80.2	63.6	52.6	36.6	31.3	52.6
Browns	46.2	38.7	49.5	60.9	71.3	82.6	85.2	79.8	69.7	55.2	43.5	38.1	60.1
Candelaria	[33.0]	[35.0]	[45.0]	53.6	59.2	71.1	76.6	74.6	64.4	50.4	41.3	32.3	[53.0]
Carlin	10.7	21.5	40.7	52.0	59.9	74.6	77.8	72.4	58.3	48.6	33.8	31.4	48.5
Carson City (1)	31.0	36.5	44.8	52.3	56.0	66.6	69.3	68.2	59.6	49.2	39.4	32.9	50.5
Carson City (2)	28.7	34.9	44.1	53.0	57.9	69.8	73.1	71.4	60.8	48.0	38.2	31.4	50.9
Dayton	28.2	38.6	46.6	57.0	61.8	....	....	....	....	....	....	....	....
Downeyville	....	....	....	....	66.4	76.4	79.4	80.4	69.0	60.1	49.4	31.8	....
Eldorado Canyon	48.5	55.2	64.6	75.8	83.1	91.6	96.9	95.5	84.4	73.4	60.0	55.7	73.7
Elko (1)	17.6	31.2	31.6	56.6	55.8	67.6	69.0	67.9	54.2	56.8	34.5	31.0	47.8
Elko (2)	16.8	24.7	41.5	50.9	59.1	69.8	73.3	70.0	53.7	46.1	35.6	31.0	47.7
Ely	22.3	29.4	41.6	50.0	55.5	65.5	74.0	62.0	54.2	47.4	38.6	32.6	47.8
Eureka	19.9	27.6	41.7	50.0	56.0	68.1	74.5	73.6	58.9	50.0	38.3	31.4	49.2
Fenelon	14.3	25.9	45.6	56.0	63.9	75.0	79.3	76.1	64.0	53.7	37.9	27.0	51.6

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Nevada—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Fergnson's Ranch					60.0	71.8	75.8	74.0	61.2	52.4	34.8	36.4	
Fort McDermitt	25.7	35.8	45.8	52.2	55.3								
Genoa	30.2	37.2	45.0	[52.0]	55.0	65.2	69.6	69.5	62.1	49.4	39.9	31.0	[50.5]
Golconda	26.9	38.1	46.8	57.0	63.1	77.8	82.1	79.1	65.5	56.2	44.6	35.4	56.0
Halleck	15.2	24.3	43.7	54.1	58.6	71.9	77.8	71.8	57.0	50.2	34.0	27.7	48.9
Hawthorne (1)					64.2	73.9	77.4	76.6	66.0	54.2	47.4		
Hawthorne (2)	33.6	39.3	50.4	57.2	63.9	80.2	84.5	80.0	63.8	54.9	45.5	42.3	58.0
Hot Springs (1)	23.2	32.0	41.2	59.7	60.9	71.4	79.4	75.2	[58.5]	54.8	40.8	34.9	[52.7]
Hot Springs (2)	23.6	34.2	42.8	60.8	63.3	75.2	81.5	77.9	62.4	51.3	37.4	34.7	53.8
Humboldt (1)	24.0	33.2	44.7	53.1	55.8	68.8	72.8	68.2	60.2	49.9	39.7	33.6	50.3
Humboldt (2)	24.4	34.2	48.5	54.3	56.9	71.5	75.7	72.0	62.1	50.9	39.7	33.6	52.0
Lewer's Ranch	29.0	36.9	44.6	52.6	54.1	70.4	74.8	72.9	64.4	51.4	40.4	31.3	51.9
Mill City	23.5	38.0	49.8	59.2	58.3	[70.0]	79.0	71.6	56.2	54.0	38.7	34.0	[52.9]
Montello	12.6	25.1	46.4	52.9	60.7	77.8							
Palisade (1)	18.1	26.8	44.7	55.6	55.2	69.6	73.2	74.6	63.5	52.5	38.9	33.7	50.5
Palisade (2)	13.7	26.9	45.2	57.1	57.6	73.7	77.8	76.5	62.5	52.4	38.9	34.5	51.4
Pioche	24.1	30.2	40.4	50.8	56.4	67.4	74.6	71.4	[59.5]	[49.5]	45.4	37.6	[50.6]
Punch Bowl						65.6	70.9	69.2	56.9				
Reno (1)	30.7	34.3	49.2	52.5	[61.0]	73.5	77.0	73.0	61.3	51.5	39.0	36.7	[53.3]
Reno (2)				52.2	56.7	69.6	74.4			50.4	39.8	32.0	
Ruby Hill				42.2	49.4	59.8	67.7	65.4	50.8		29.0	32.4	
St. Clair				50.8			75.6	72.6	60.8	51.1	35.0	32.3	
Sodaville						75.7	81.8	79.3	68.2	54.2		37.4	
Tecoma	15.2	27.2	48.8	56.3	63.2	75.9	82.7	81.3	63.6	52.3	36.6	31.6	52.9
Toano	14.7	25.2	46.7	56.1	61.6	74.7	82.5	81.5	61.5	51.1	35.7	31.4	51.9
Tuscarora	20.2	26.4	39.8	46.8	[56.0]	61.9	68.6	66.2	54.2	45.6	34.8	25.2	[45.5]
Verdi	27.7	33.9	43.4	50.2	55.6	68.5	73.9	71.0	63.1	50.4	38.8	31.8	50.7
Virginia City					57.4	71.0	76.6		65.6	53.4	40.9	31.9	
Wadsworth					63.6	77.8	83.9	80.8	66.5	54.5	42.9	37.8	
Wellington	26.9	32.9	37.4	46.8	50.8								
Wells	11.8	20.7	45.8	51.2	58.2	78.0	80.3	80.4	57.5	49.8	37.8	32.9	50.4
Winnemucca (1)	21.6	32.4	45.2	51.8	56.8	68.6	72.9	70.8	58.5	50.9	37.8	31.2	49.9
Winnemucca (2)	21.9	29.8	46.0	56.5	58.4	73.6	79.3	72.4	60.0	47.5	35.5	35.5	51.4

New Hampshire:													
Berlin Falls	[29.0]	[16.0]	[34.0]	42.4	55.4	63.2	64.1	59.6	55.4	38.4	33.1	22.7	[42.8]
Berlin Mills	24.6	10.4	36.4	46.3	57.0	65.2	72.2	65.7	62.4	45.9	40.4	24.4	45.4
Chesterfield	23.7	12.6	30.1	44.3	......	......	63.9	......	57.1	39.2	33.6	......	......
Concord	29.2	21.2	35.3	48.6	59.6	66.8	67.8	64.7	61.1	45.2	40.4	31.4	47.6
Hanover (1)	25.4	15.2	31.6	46.5	59.2	65.4	69.5	63.8	58.7	42.4	36.8	26.5	45.1
Hanover (2)	......	......	......	......	......	......	......	62.9	58.2	42.4	37.4	27.1	......
Manchester (1)	29.9	21.5	36.4	48.5	60.4	68.1	68.8	66.1	61.5	45.5	40.8	31.9	48.3
Manchester (2)	29.6	20.3	35.3	48.2	60.6	68.7	69.1	66.7	62.3	46.0	41.9	32.4	48.4
Manchester (3)	29.9	20.7	35.6	48.0	60.0	67.4	68.6	65.7	61.8	45.9	41.0	32.6	48.1
Nashua	19.8	24.0	28.0	41.4	60.0	66.0	75.2	67.1	57.2	48.8	[40.0]	[30.0]	[46.5]
Newton	[30.0]	[21.0]	[35.0]	46.8	58.6	66.5	67.6	65.0	60.9	44.8	39.6	33.1	[47.4]
North Conway	[24.5]	16.7	33.6	46.8	57.4	69.5	66.6	63.3	59.5	42.6	37.7	27.2	[45.4]
North Sutton	[24.3]	16.0	31.6	44.4	55.6	65.2	65.6	62.6	57.9	41.9	37.4	27.8	[44.2]
Plymouth	24.3	13.9	32.0	46.8	56.2	65.5	67.8	64.2	59.8	41.4	36.9	27.4	44.7
Shaker Village	27.9	19.0	33.9	43.5	58.8	65.6	61.0	62.9	59.4	42.7	36.7	28.2	45.0
Stratford	25.6	17.2	33.4	49.0	60.6	64.4	69.1	66.4	61.1	43.8	38.2	27.1	46.3
Walpole	26.0	15.0	31.0	43.8	56.2	63.0	65.3	63.0	58.0	41.6	37.3	28.0	44.0
West Milan	22.1	11.8	29.0	41.4	54.8	62.4	63.0	60.4	55.6	40.5	35.1	23.8	41.7
New Jersey:													
Allaire	[37.0]	27.2	40.6	48.8	59.6	68.2	71.6	68.8	63.6	50.8	45.3	41.3	[51.9]
Asbury Park	36.2	28.5	40.4	49.1	[62.5]	69.6	71.5	70.8	66.6	51.9	45.6	42.1	[52.9]
Atlantic City	37.6	29.5	38.8	48.6	59.0	66.2	71.8	69.3	64.4	51.8	47.0	43.6	52.3
Beverly	35.6	27.4	40.5	52.3	62.4	69.8	72.8	69.6	64.0	49.9	44.9	40.9	52.5
Billingsport L. H.	37.6	29.2	41.9	53.7	64.4	72.3	76.7	73.2	65.6	52.5	46.2	41.4	54.6
Bridgetown	39.3	32.9	43.6	55.2	66.3	73.2	76.6	74.1	67.0	53.6	44.4	44.2	55.9
Cape May C. H.	40.8	31.4	42.4	51.9	62.5	74.3	72.8	70.7	65.8	52.6	49.6	46.6	55.1
Egg Harbor City	36.1	28.3	42.0	50.6	60.9	68.9	72.0	69.6	63.7	50.2	45.4	41.9	52.5
Freehold	35.7	27.0	39.0	50.2	60.7	68.7	72.1	69.8	63.8	49.8	45.0	40.9	51.9
Gillette	34.0	26.3	39.4	50.0	62.6	68.6	72.1	69.4	63.1	49.7	44.4	38.9	51.5
Hanover	33.8	28.4	44.4	[51.5]	63.4	69.6	71.3	66.4	60.4	45.1	40.5	37.8	[51.0]
Highland Park	36.1	26.8	40.1	50.7	61.5	69.8	73.0	69.8	64.0	49.6	45.0	39.9	52.2
Imlaystown	35.8	27.2	39.4	[52.0]	62.5	70.1	73.0	70.7	64.0	51.3	45.4	41.6	[52.8]
Jersey City	36.9	29.0	41.2	50.2	58.4	71.6	[73.0]	72.1	64.0	50.8	46.4	41.0	[52.9]
Lambertsville	36.5	28.0	40.7	52.9	63.0	68.9	72.4	70.1	65.2	50.8	46.4	41.2	53.0
Locktown	33.9	25.2	39.3	51.0	62.4	70.3	73.8	70.2	63.9	49.8	43.2	40.2	51.9
Madison	33.6	25.1	38.7	50.9	62.0	69.0	72.1	70.3	63.0	48.6	43.7	38.3	51.3
Morristown	35.5	27.0	39.8	51.1	62.0	69.1	72.7	69.9	64.7	49.8	44.8	41.0	52.2
Newark	35.6	27.2	40.5	51.3	63.6	71.6	74.0	70.7	64.4	50.4	45.6	41.0	53.0
New Brunswick (2)	38.3	26.8	40.2	51.0	61.7	70.0	72.5	70.1	65.3	50.8	45.7	41.0	52.8
New Brunswick (3)	35.3	27.3	40.2	51.7	[62.0]	68.8	74.2	69.7	64.1	50.8	[45.7]	40.2	[52.5]

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
New Jersey—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Ocean City	38.6	31.1	38.6	50.8	60.3	66.7	74.0	72.4	66.9	53.1	48.5	43.5	53.7
Oceanic	38.6	29.4	42.4	52.9	63.0	70.6	74.6	72.4	66.2	52.4	47.4	41.1	54.2
Paterson	36.6	27.1	40.7	51.4	62.7	69.9	.....	.....	.....	.....	.....	.....	.....
Plainfield	34.3	27.0	39.8	49.2	60.6	68.3	71.9	69.8	63.7	50.1	44.9	38.9	51.5
Princeton	35.3	26.6	40.0	51.4	63.2	70.1	73.0	[71.5]	64.4	50.1	44.8	40.9	[52.6]
Readington	38.8	30.2	42.4	48.6	66.2	72.1	77.0	71.7	67.8	55.8	48.9	44.1	55.3
Somerville	35.6	27.3	41.4	51.4	.....	.....	.....	.....	.....	.....	.....	.....	.....
South Orange	33.6	25.2	39.0	50.1	60.7	68.4	70.9	68.1	62.8	48.4	44.3	38.6	50.8
Tenafly	32.8	24.4	38.5	49.1	62.3	69.5	71.3	68.4	63.4	48.3	43.6	39.2	50.9
Tom's River	36.1	27.7	39.2	50.1	60.2	69.8	73.2	70.4	64.5	50.3	[47.0]	[43.5]	[52.7]
Trenton	38.0	29.0	43.0	55.0	67.0	70.0	77.0	76.0	67.0	53.0	48.0	44.0	55.6
Union	33.6	25.7	39.1	50.1	60.7	68.5	71.3	69.0	63.0	48.7	44.1	38.4	51.0
Woodbury	[39.0]	[30.0]	[42.0]	51.2	62.1	71.4	73.5	72.3	66.1	52.5	47.1	44.0	[54.3]
New Mexico:													
Albuquerque	[25.0]	[30.0]	[42.0]	58.1	63.0	70.1	78.3	76.6	66.0	63.8	39.8	43.8	[54.7]
Coolidge	18.6	22.5	32.1	50.5	56.2	65.8	73.2	74.0	59.0	49.0	37.6	36.9	48.0
Deming	39.6	41.8	51.9	65.4	74.5	81.8	86.7	87.1	74.3	65.1	52.4	48.2	64.1
Fort Bayard	37.8	39.0	47.5	56.6	61.6	69.4	73.3	72.7	64.5	57.7	45.1	[49.0]	[56.2]
Fort Marcy	[24.5]	[30.0]	[42.0]	51.7	56.7	64.8	71.3	71.4	60.0	51.3	33.1	37.4	[49.5]
Fort Seldon	42.7	48.2	[53.0]	[60.0]	67.9	76.2	83.6	81.9	70.2	62.0	45.8	49.7	[61.8]
Fort Stanton (1)	29.6	36.0	41.8	52.8	59.0	64.9	69.3	68.2	59.4	52.8	38.2	43.7	51.3
Fort Stanton (2)	[30.0]	[36.0]	[42.0]	52.9	59.4	64.9	69.7	69.1	59.8	53.3	38.4	43.8	[51.6]
Fort Union	15.5	30.9	[41.0]	45.9	48.2	68.0	63.3	60.6	53.6	45.5	31.4	38.4	[44.4]
Fort Wingate	24.2	28.4	40.4	51.6	56.4	64.8	[72.0]	68.7	[60.0]	[48.5]	37.7	41.0	[49.5]
Gallinas Springs	33.2	40.3	48.6	58.2	64.6	71.6	78.0	77.4	68.4	60.1	40.5	49.2	57.5
Hillsborough	.....	.....	.....	.....	.....	71.9	76.6	75.6	65.4	58.1	42.0	47.8	.....
Las Vegas	24.0	27.2	41.5	52.4	59.0	60.4	72.0	67.1	56.2	44.9	34.5	44.4	48.6
Lava	32.2	37.0	48.5	60.0	67.2	73.8	80.6	80.4	69.4	59.4	39.0	46.4	57.8
Lordsburg	39.2	42.4	50.5	62.3	75.4	81.6	85.2	87.2	73.1	62.4	45.8	50.6	63.0
Los Lunas	.....	.....	.....	.....	70.0	73.3	78.6	78.7	67.2	59.8	39.3	43.6	.....
Santa Fé	24.6	29.6	41.6	51.6	56.4	64.2	70.5	70.9	61.0	52.1	35.2	39.8	49.8
New York:													
Albany	31.0	20.4	36.6	50.0	60.8	68.4	72.5	69.8	64.2	48.7	43.2	35.0	50.0

Alfred Centre	*[28.0]*	*[17.5]*	*[33.0]*	*41.7*	*55.8*	*61.3*	*65.8*	*62.2*	*57.8*	*39.7*	*36.9*	*34.8*	[44.8]
Angelica	*28.7*	*17.0*	*32.4*	*43.3*	*56.6*	*62.3*	*67.4*	*61.5*	*58.1*	*39.6*	38.1	34.3	44.9
Arcade	...	...	...	...	*56.2*	*61.8*	*67.1*	*62.2*	...	...	...	...	...
Ardenia	34.5	26.0	39.5	50.8	62.5	*69.0*	71.2	68.2	63.8	47.8	44.7	38.2	51.4
Auburn	31.2	[19.5]	[33.5]	[45.0]	56.4	64.6	69.6	65.0	60.7	43.5	41.8	36.9	[47.3]
Barnes' Corners	22.1	13.7	28.6	41.2	...	...	...	...	...	...	...	...	...
Boyd's Corners	33.2	24.2	39.3	51.2	63.8	70.8	72.8	69.3	64.1	48.6	44.6	37.4	51.6
Brooklyn	40.9	...	...	...	...	...	...	...	...	51.6	47.4	44.0	...
Buffalo	29.8	18.5	33.4	43.4	54.6	61.9	69.9	67.4	62.6	45.2	40.6	37.5	47.1
Canton	23.7	11.3	29.6	43.9	57.5	62.8	68.1	63.5	57.8	38.8	35.4	28.2	43.4
Carmel	31.4	22.2	37.6	49.4	61.4	68.4	71.0	68.2	63.3	47.6	43.0	[35.0]	[49.9]
Central Park, New York City	35.7	27.8	39.7	51.2	63.5	70.5	73.2	70.6	65.2	49.7	44.7	40.0	52.6
Constableville	22.9	12.9	29.0	41.8	55.8	61.5	67.4	61.2	56.5	38.4	35.6	28.6	42.6
Cooperstown	27.0	16.1	31.4	44.3	57.0	62.9	66.9	62.4	58.7	41.6	37.7	32.7	44.9
Davids Island	33.6	26.2	37.1	46.7	59.8	67.6	71.1	70.1	61.4	50.1	44.1	38.6	50.8
Elmira	31.6	21.4	36.9	47.6	61.6	68.0	73.2	69.6	63.3	45.5	42.0	37.3	49.8
Eden	31.2	21.2	32.8	43.8	60.0	67.6	73.6	69.4	64.0	45.0	40.0	39.0	49.0
Factoryville	29.7	18.7	34.7	46.0	59.2	64.6	69.0	64.6	59.8	42.9	39.1	34.5	46.9
Fleming	[28.5]	[18.5]	[33.0]	43.4	56.8	62.5	69.7	66.1	60.6	42.6	39.3	33.4	[46.2]
Fort Columbus	36.4	18.2	40.9	50.6	62.0	65.4	73.8	72.8	66.7	52.0	46.6	41.1	52.2
Fort Hamilton	37.0	27.9	40.4	49.0	59.8	68.0	72.1	71.1	65.3	52.0	46.7	41.3	52.6
Fort Niagara	32.0	21.8	35.2	45.1	57.2	63.2	72.7	69.3	64.1	46.9	42.7	39.2	49.1
Fort Porter	28.5	17.7	32.8	42.5	54.7	61.6	70.2	67.5	62.7	43.0	40.4	37.7	46.6
Fort Schuyler	37.5	26.1	39.6	48.4	60.0	67.4	72.1	70.4	65.2	50.8	43.9	39.4	51.7
Fort Wadsworth	35.9	27.7	40.6	50.4	61.2	69.7	73.4	72.0	65.5	51.4	44.8	40.7	52.8
Friendship	27.8	19.9	35.7	44.3	56.3	61.8	67.4	61.8	...	...	...	...	...
Geneva	39.2	20.3	34.4	45.6	59.3	63.9	70.8	65.8	63.3	43.7	41.1	37.7	48.0
Hess Road Station	30.7	19.3	33.6	44.4	56.4	61.9	70.1	65.5	68.2	42.7	39.8	35.3	47.3
Honeymead Brook	...	...	...	...	...	65.0	68.1	64.8	63.0	45.3	40.0	33.6	...
Humphrey	27.8	16.8	32.5	45.4	58.8	63.2	69.4	65.6	60.4	44.1	39.8	37.0	46.7
Ilion	28.0	17.5	32.7	45.4	59.1	64.9	68.8	64.4	59.7	43.5	40.3	34.3	46.6
Ithaca	29.8	20.0	32.7	45.7	59.3	65.6	70.2	65.5	60.6	43.1	40.0	35.4	47.3
Kingston	29.2	21.0	35.0	48.8	63.0	70.2	73.2	69.8	63.8	47.6	42.4	35.0	49.9
Lee Roy	28.0	17.8	33.2	44.8	57.5	...	...	...	...	...	...	...	...
Lyons	30.1	19.4	34.2	46.0	59.3	63.5	70.7	65.7	61.4	43.6	40.9	36.5	47.6
Madison Barracks	28.1	13.1	30.4	43.7	57.2	62.5	67.6	63.7	61.2	41.4	36.7	31.4	44.8
Middleburgh	30.0	20.9	35.0	47.0	60.8	66.0	69.9	65.1	60.7	44.1	40.2	35.2	47.9
Newfane	28.7	19.0	31.1	...	57.8	64.1	74.6	...	61.9	...	...	...	...
New York City	37.6	28.0	41.5	51.6	62.0	70.4	73.5	71.5	65.8	52.0	46.0	41.4	53.5
Nineveh	24.8	11.2	31.0	47.9	60.4	66.2	70.2	66.4	61.8	45.7	40.2	36.5	46.9
North Hammond	27.4	12.6	31.4	44.8	57.9	65.3	72.0	66.8	61.3	41.6	37.3	30.8	45.8

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
New York—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Number Four	23.0	11.6	28.9	38.2	54.4	59.5	64.6	60.1	55.9	37.0	33.7	28.0	41.2
Oswego	28.8	18.0	31.6	43.3	55.2	61.0	69.0	65.8	61.4	43.9	39.6	34.7	46.0
Palermo	28.0	18.4	31.8	44.2	57.2	63.0	68.4	63.6	60.1	41.8	39.1	33.7	45.8
Palmyra	29.9	19.4	34.6	47.4	61.1	66.0	72.6	67.3	62.6	43.8	41.2	38.8	48.7
Pendleton Centre	26.8	17.1	31.0	42.0	55.9	62.6	69.6	64.7	59.7	44.4	38.3	33.8	45.5
Perry City	27.6	16.8	31.7	43.1	57.4	63.8	67.6	61.5	58.2	40.6	37.9	33.5	45.0
Plattsburgh Barracks	25.0	17.8	33.0	47.3	59.8	65.5	69.3	66.0	60.6	42.9	39.0	29.3	46.3
Potsdam	24.5	12.5	29.3	45.1	59.8	64.3	70.2	64.0	61.3	36.1	28.7	28.7	43.7
Queensbury	23.0	11.9	31.6	44.8	58.5	67.0	69.2	63.8	57.0	[44.0]	36.6	27.8	[44.6]
Rochester	29.5	17.7	34.0	45.9	57.6	63.4	70.2	66.3	62.2	43.9	40.3	36.6	47.3
Rome	......	......	......	......	59.4	64.2	69.6	64.8	61.1	42.2	38.0	33.0	......
Salem	23.8	18.7	34.0	47.6	58.8	......	......	......	......	......	......	......	......
Saranac Lake	24.0	13.6	30.4	41.6	55.9	60.7	65.5	60.8	56.2	38.1	35.0	28.4	42.5
Savona	28.6	18.2	33.1	45.7	59.0	64.6	69.2	63.5	59.5	41.4	40.9	[35.0]	[46.6]
Setauket	35.7	27.4	38.5	48.3	59.6	68.4	71.6	68.8	64.3	51.5	46.3	41.5	51.8
Somerset	26.9	17.6	31.6	43.3	56.4	63.6	71.2	66.3	......	......	......	......	......
South Canisteo	30.7	21.1	35.2	45.0	58.0	63.6	67.6	61.9	58.5	41.9	39.9	34.4	46.5
South Kortright	26.8	17.0	32.0	44.8	56.8	63.0	65.4	60.6	57.6	40.3	39.3	34.0	44.8
Tannersville	......	......	29.5	......	56.4	62.2	64.2	60.8	56.6	41.6	......	......	......
Turin	......	......	......	......	......	......	......	64.2	58.7	39.0	35.4	28.3	......
Watervliet Arsenal	30.8	19.8	36.2	49.8	61.3	66.7	70.3	66.7	61.9	45.2	40.3	34.3	48.6
Wedgewood	29.0	17.9	33.3	45.3	59.1	65.2	70.4	66.4	60.4	43.1	39.5	34.8	47.0
West Point	31.3	23.0	36.6	46.7	60.4	66.5	70.7	68.8	62.4	47.4	42.8	35.4	49.3
White Plains	35.6	27.3	40.6	50.2	60.6	68.2	70.9	67.9	62.9	49.4	45.4	40.2	51.6
Willets Point	34.9	26.6	39.6	49.4	60.6	68.6	71.9	70.0	64.7	51.2	45.6	41.5	52.0
North Carolina:													
Asheville	38.8	36.3	45.4	56.4	62.6	67.2	72.9	68.8	63.9	52.3	45.3	51.2	55.1
Chapel Hill	46.6	37.9	47.4	58.9	69.1	......	......	......	......	56.0	51.2	52.5	......
Charlotte	44.1	39.4	51.0	61.2	70.4	73.4	78.8	74.0	70.1	58.5	51.8	54.7	60.6
Clarkton	......	......	......	......	......	......	......	74.7	70.3	58.1	52.6	......	......
Clear Creek	......	......	......	......	......	......	......	73.4	70.7	58.8	47.4	51.2	......
Fayetteville	......	......	......	59.4	75.0	74.3	76.9	73.0	67.4	......	......	......	......
Franklin	......	......	......	......	......	......	73.8	73.2	64.9	51.2	44.7	47.6	......

Goldsborough					*70.9*	*76.4*	*78.8*	*76.5*	*69.9*	*60.5*	*56.0*		
Grover					*68.9*	*73.2*	*78.2*	*74.7*	*74.8*				
Hatteras	*47.6*	*43.6*	*47.1*	*56.4*	68.4	73.5	77.8	76.2	71.0	61.0	57.6	54.6	61.2
Highlands						61.6	66.8	62.0	58.4	48.3	41.4	46.7	
Hot Springs	41.1	38.4	47.5	58.1	63.7	65.3	73.8	71.4	67.0	55.8	48.1	52.9	56.9
Kitty Hawk	49.0	41.2	47.0	57.6	68.5	75.3	78.1	76.6	[70.0]	[60.0]	55.9	54.0	[61.1]
Lenoir	38.1	35.9	47.6	58.7	63.9	69.0	74.0	70.4	65.8	54.0	47.0	48.9	56.1
Lumberton					69.8	75.4	79.6	75.6	70.8	58.4	54.6		
Monroe	45.1	40.9	49.7	62.4	69.9	74.8	78.9	73.8	69.4	57.5	51.4	[54.5]	[60.7]
Morganton	[38.5]	36.8	47.8	59.6	66.0	72.5	76.4	69.5	66.5	53.1	46.3	50.4	[57.0]
Mount Airy					63.4	54.2	73.4	71.2	66.2	53.5	47.6	48.2	
Mount Pleasant	41.3	37.0	47.8	58.7	67.0	72.4	76.5	72.2	67.5	55.1	49.8	51.0	58.0
New Berne	48.0	44.0	49.0	[58.0]	67.0	72.0	77.2	74.6	69.5	59.2	55.4	54.0	[60.7]
Pittsborough							76.0	72.0	66.7	55.1	51.1	49.2	
Raleigh	44.2	38.2	47.2	58.3	68.2	73.6	77.5	73.4	68.7	57.6	52.7	53.4	59.4
Salisbury	44.4	41.2	52.7	62.5	71.6	75.5	81.2	76.4	71.4	58.2	52.0	54.6	61.8
Soapstone Mountain	[44.0]	[38.5]	44.6	55.1	69.6	75.4	75.4	71.6	66.8	52.6	47.2	47.0	[57.3]
Southern Pines	[45.0]	44.4	52.4	65.6	75.3	79.6	[78.0]	[74.5]	70.8	64.0	58.4	57.8	[63.8]
Southport	49.4	44.6	50.2	59.5	70.0	76.2	79.6	76.2	71.6	62.6	56.8	54.6	62.6
Statesville	40.0	36.9	48.6	60.0	68.6	72.7	77.6	74.6	68.4	[54.5]	[47.0]	[49.0]	[58.2]
Wadesborough					68.9	74.7	78.3	73.8	69.8	57.7	53.4		
Wake Forest		38.8	46.7	58.0	68.8								
Washington		40.7		59.5	69.6	73.2	75.8	74.4				49.5	
Weldon (1)					68.0	74.0	77.8	74.2	68.4	55.6	51.9		
Weldon (2)	43.0	37.1	46.0	57.4	67.4	74.0	77.1	73.5	67.6	54.6	51.9	50.0	58.3
Wilmington	50.0	44.4	51.9	60.6	70.9	75.5	79.0	76.0	71.8	60.9	56.8	56.0	62.8
Winslow								72.1	68.4	57.4	53.2	51.8	
North Dakota:													
Bismarck	14.7	10.7	36.2	48.9	52.4	65.0	68.7	70.3	55.8	47.4	26.4	16.0	42.7
Carrington			35.0	48.4	51.9	65.4	67.2	68.2					
Fort Abraham Lincoln	13.9	5.5	35.1	48.5	52.5	65.3	69.7	70.7	55.9	46.0	25.0	14.8	41.9
Fort Buford (1)	11.8	15.4	38.0	50.7	53.1	65.6	69.8	69.3	53.8	47.2	24.3	14.9	42.8
Fort Buford (2)	10.6	13.2	35.2	48.7	51.2	63.7	67.6	68.8	52.8	47.2	23.5	14.1	41.4
Fort Pembina	7.1	− 0.8	29.4	41.3	51.3	64.0	66.1	67.2	53.4	41.5	26.0	11.8	38.2
Fort Totten	12.0	11.0	35.5	46.4	52.8	65.5	68.2	69.4	55.8	44.9	24.9	10.4	41.4
Fort Yates (1)	12.2	10.4	34.8	49.1	52.4	64.5	67.1	72.5	58.0	[48.0]	[26.5]	22.3	[43.3]
Fort Yates (2)	17.1	14.3	38.4	49.0	56.2	68.0	71.6	73.8	59.0	49.6	30.2	24.2	46.0
Gallatin	5.4	− 3.0	28.2	45.4	47.5	65.8	63.7	69.2	48.4	38.0	23.4	16.6	37.4
Napoleon						64.9	67.9	70.9	54.4	44.3	25.8	20.9	
New England City	9.6	11.4	32.7	46.7	50.0	64.2	67.2	71.0	54.4	33.8	25.7	16.1	40.6

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
North Dakota—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Steele	[11.5]	[11.0]	[36.0]	47.0	52.2	64.6	69.6	72.0	57.6	47.6	26.4	17.4	[42.7]
Wahpeton	......	......	......	......	......	......	69.6	70.1	58.0	44.6	27.0	22.4	......
Ohio:													
Akron	31.3	22.9	38.3	47.3	59.1	64.8	71.5	67.4	62.0	46.7	40.6	41.1	49.4
Ashland	......	......	......	......	......	......	......	......	61.1	46.5	39.9	41.0	......
Athens	35.1	29.8	42.1	52.0	59.9	66.8	72.8	68.9	61.9	47.8	41.8	45.7	52.0
Bangorville	30.6	22.8	39.3	47.8	57.8	64.3	70.5	67.2	61.3	46.2	38.5	40.8	48.9
Beallsville	......	......	......	......	61.8	70.2	75.0	71.7	......	......	......	......	......
Bellevue	30.8	22.6	36.6	44.8	57.8	64.6	70.3	66.8	61.2	46.6	39.2	40.8	48.5
Bement	......	......	......	......	......	......	......	61.6	62.0	47.7	44.2	41.6	......
Canton	32.1	24.1	39.2	48.0	59.5	66.8	72.6	67.3	62.3	46.1	40.8	41.1	50.0
Carrollton	[33.0]	[26.0]	37.4	47.6	58.8	65.7	72.4	67.4	62.6	45.0	41.5	41.0	[49.9]
Celina	33.6	26.1	42.4	51.4	61.1	66.4	72.2	69.9	63.3	48.9	41.3	45.2	51.8
Cincinnati	37.2	30.3	45.8	54.4	62.8	69.6	75.5	72.3	66.2	51.6	43.1	48.2	54.8
Clarksville	[35.0]	26.9	42.3	52.1	60.6	67.1	73.0	69.8	62.2	47.9	40.0	45.1	[51.8]
Cleveland (1)	33.1	24.3	37.8	47.0	59.4	65.5	70.9	67.2	62.4	48.2	42.2	42.2	50.0
Cleveland (2)	32.6	23.2	37.4	46.7	59.1	65.4	71.0	68.2	63.2	47.6	41.8	42.0	49.8
College Hill	36.0	29.6	46.1	56.5	65.0	71.2	77.4	75.4	67.1	53.8	43.8	47.6	55.8
Collingwood	31.4	23.0	35.5	47.1	59.5	......	......	......	......	......	......	......	......
Columbus Barracks	34.8	27.3	42.0	52.7	62.1	63.1	74.0	70.7	64.4	50.0	41.6	44.7	52.3
Columbus	34.2	26.4	42.2	51.8	61.4	67.7	74.1	70.2	63.8	49.0	41.2	44.6	52.2
Dayton	34.9	29.4	42.3	52.6	62.9	69.9	76.2	71.7	65.0	48.3	41.5	46.2	53.4
Demos	35.7	25.4	41.8	50.4	59.8	65.6	69.9	64.8	61.2	48.2	41.3	43.9	50.7
Elyria	32.8	23.3	38.4	48.2	59.7	65.8	72.1	68.2	62.5	48.8	41.2	41.4	50.2
Findley	......	......	......	......	......	......	......	......	61.4	46.4	39.3	42.0	......
Fostoria	32.2	23.3	40.1	[49.0]	61.6	68.1	74.6	71.2	[63.0]	48.4	41.2	42.2	[51.2]
Garrettsville	29.1	20.6	35.3	44.8	55.8	63.0	68.0	63.0	59.7	43.6	38.3	38.6	46.6
Georgetown	35.7	29.9	44.5	55.3	62.6	68.6	74.6	72.0	65.1	49.8	41.3	47.1	53.9
Granville	32.3	24.8	40.5	50.0	59.3	65.9	72.3	69.3	62.3	47.5	39.8	[44.5]	[50.7]
Gratiot	......	......	......	51.5	62.5	68.3	72.5	69.9	64.5	49.9	41.8	45.9	......
Greenville	32.2	25.1	40.9	50.3	59.7	65.4	71.7	67.2	61.1	46.6	39.3	43.4	50.2
Hanging Rock	35.7	31.6	43.5	52.3	59.9	66.9	72.8	68.7	62.1	48.5	42.2	46.7	52.6
Hiram	30.7	20.8	30.0	45.1	57.4	63.6	71.1	66.0	60.0	45.0	38.5	39.7	47.3

Jacksonborough	*33.2*	*26.8*	*42.6*	*50.8*	*63.4*	*68.6*	*76.1*	*73.0*	*64.0*	*48.0*	*39.7*	*44.8*	*52.6*
Jefferson	*29.7*	*20.3*	*35.1*	*44.7*	*56.3*	*62.5*	*67.9*	*64.6*	*60.5*	*44.1*	*39.5*	*38.4*	*47.0*
Kent	*[31.0]*	*24.6*	*33.3*	*46.6*	*59.2*	*68.3*	*72.4*	*68.2*	*62.0*	*49.2*	*41.4*	*42.3*	*[49.9]*
Kenton	33.0	25.5	39.0	48.4	57.8	65.4	70.2	67.3	62.1	46.5	40.6	43.4	49.9
Leipsic	......	......	......	......	......	72.0	78.0	71.0	63.6	52.6	......	......	......
Logan	34.9	29.4	41.3	51.3	60.5	66.9	72.0	69.0	62.2	48.3	41.2	44.5	51.8
Lordstown	31.1	22.5	37.3	47.3	59.0	65.9	70.8	66.1	61.3	45.1	40.2	39.4	48.8
Marietta (2)	36.7	30.3	43.3	53.0	62.3	69.2	74.2	69.9	64.7	49.1	43.3	45.7	53.5
McConnellsville	35.3	28.6	41.9	50.9	62.0	67.9	73.4	69.9	64.6	49.1	42.7	45.0	52.6
Napoleon	34.0	25.8	40.7	49.2	60.9	67.4	74.3	71.3	62.2	47.8	41.0	41.9	51.4
New Alexandria	33.4	25.1	41.1	50.1	60.6	65.9	72.0	69.0	63.7	49.2	41.4	43.8	51.3
New Athens	......	......	......	......	......	67.6	75.6	65.4	65.1	46.8	......	......	......
New Comerstown	32.2	26.0	39.8	49.1	60.0	66.7	72.6	67.1	61.0	45.8	40.1	41.3	50.1
North Lewisburgh	33.6	27.1	42.1	52.0	63.0	68.4	74.7	70.8	64.3	48.6	40.6	44.3	52.4
Oberlin	31.2	22.4	36.1	45.9	57.5	63.2	70.8	67.9	63.0	46.6	39.9	42.5	48.9
O. S. University	33.0	26.4	41.2	50.7	60.6	67.1	73.0	68.8	62.6	47.1	40.7	43.6	51.2
Orangeville	[30.0]	[24.0]	32.0	43.2	56.4	65.0	70.6	63.4	57.9	40.4	36.8	34.9	[46.2]
Poland	[32.0]	[24.5]	36.0	42.8	53.4	61.7	69.9	60.5	57.4	45.6	39.7	39.2	[46.9]
Pomeroy	38.6	33.4	46.3	57.2	65.4	71.3	77.5	74.7	67.0	52.5	45.4	48.7	56.5
Portsmouth	37.8	35.0	44.9	58.9	64.8	68.8	73.9	69.8	63.8	50.2	43.7	48.7	54.8
Salineville	......	......	35.4	44.6	58.2	......	......	......	......	47.6	40.7	40.9	......
Sandusky	31.8	21.6	36.8	46.4	59.5	66.2	72.0	69.8	64.0	48.3	41.0	41.6	49.9
Shanesville	[34.0]	[25.5]	[40.0]	49.4	57.7	67.8	74.0	70.4	64.4	50.0	41.3	42.5	[51.4]
Shiloh	......	......	......	......	56.4	63.2	67.6	65.0	59.6	46.5	40.0	42.6	......
Sidney	33.0	25.5	42.0	50.7	61.5	69.0	74.1	71.1	63.0	[47.5]	39.8	43.5	[51.7]
Tiffin	32.2	24.2	38.6	48.8	60.5	66.6	72.8	70.3	63.4	48.1	41.7	43.5	50.9
Toledo	31.6	21.0	38.2	47.7	59.3	65.5	72.0	69.3	62.8	47.8	40.5	41.4	49.8
Upper Sandusky	33.0	24.9	40.1	49.1	60.2	66.4	72.6	69.1	62.1	48.1	40.8	42.7	50.8
Vienna	[30.0]	[23.5]	31.4	46.0	59.4	66.0	70.8	65.5	61.6	45.8	39.1	38.1	[48.1]
Wapakoneta	31.3	24.5	39.8	50.4	59.9	66.9	[71.0]	71.3	65.6	51.9	39.9	42.9	[51.3]
Wauseon	29.4	20.2	37.2	47.2	58.4	64.8	71.4	68.0	61.0	45.2	38.1	38.8	48.3
Waverly	......	......	......	......	......	69.9	76.0	72.6	65.8	51.9	44.5	48.6	......
Westerville	32.5	25.8	40.0	49.9	59.3	65.9	71.2	66.4	60.6	46.6	40.6	42.2	50.1
West Milton	36.6	29.5	46.8	56.0	64.4	70.9	76.4	72.9	68.1	52.0	42.8	44.9	55.1
Wooster	31.1	22.9	38.7	47.1	57.8	64.5	70.0	66.0	60.8	45.3	39.3	40.7	48.7
Yellow Springs	33.3	27.7	41.8	51.1	60.1	67.2	72.6	69.1	62.7	47.8	40.4	44.2	51.5
Youngstown	32.9	24.8	39.6	48.6	58.7	67.6	72.5	67.9	63.8	48.1	42.7	42.0	50.8
Oregon:													
Albany	40.0	44.8	52.7	53.8	58.6	66.1	69.9	63.2	61.6	54.4	45.3	39.0	54.1
Ashland (1)	42.7	44.3	51.3	59.3	63.8	76.3	78.9	68.3	62.1	53.0	43.5	35.0	56.5
Ashland (2)	......	......	......	57.2	59.5	70.1	74.5	67.4	63.0	56.3	......	......	......

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Oregon—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Astoria	46.7	44.8	51.8	52.6	57.6	60.4	62.2	59.2	59.4	57.6	49.2	40.7	53.0
Baker City	......	......	......	......	......	......	71.5	66.0	54.8	51.1	36.2	26.1	......
Bandon	45.9	49.2	50.8	52.5	54.6	56.6	57.7	56.9	55.4	55.2	50.8	45.3	52.6
Beulah	......	......	......	......	......	......	......	......	60.8	52.6	37.0	25.8	......
Creswell	......	......	......	......	56.6	68.3	70.8	66.5	62.0	56.1	45.6	......	......
Eola	38.0	42.6	51.7	52.6	57.9	65.0	70.3	63.9	61.2	54.9	49.6	36.1	53.6
Fort Klamath	24.0	31.8	41.4	46.8	50.8	60.2	61.6	......	......	......	......	......	......
Grant's Pass	[43.0]	[46.0]	52.1	53.8	59.7	68.4	75.4	67.2	61.2	54.8	44.4	37.2	[55.3]
Heppner	......	......	......	......	......	67.0	72.3	66.7	62.0	53.5	42.8	31.3	......
Hood River	......	......	......	......	......	......	......	......	60.4	56.1	43.2	33.8	......
Jacksonville	......	......	......	54.6	59.3	70.2	75.4	64.5	63.5	54.6	45.8	......	......
La Grande	[26.5]	[35.0]	[51.0]	51.5	55.6	63.7	70.6	67.4	57.4	51.8	40.2	28.0	[49.9]
McMinnville	38.5	42.1	51.7	52.2	......	......	......	......	60.0	53.4	44.0	36.8	......
Mount Angel	38.7	43.8	52.9	53.7	59.7	66.9	75.4	65.0	62.0	54.5	45.0	37.3	54.6
Portland	38.4	44.2	53.8	54.3	60.3	66.0	70.4	68.8	61.4	57.2	47.6	38.6	54.8
Roseburgh	42.0	45.2	52.7	54.4	58.5	65.0	70.4	65.0	61.0	54.6	46.8	40.0	54.6
Saint Helens	......	......	......	......	......	......	......	......	61.2	56.5	47.1	37.5	......
Siskiyou	36.4	43.4	48.4	53.2	55.8	69.8	74.3	67.8	64.1	53.1	47.4	33.2	53.9
The Dalles	......	......	......	54.0	61.1	71.0	74.3	68.4	60.9	53.8	40.4	......	......
Tillamook	49.9	49.9	51.7	50.5	56.0	61.8	61.1	58.4	57.3	54.8	48.5	39.2	53.3
Pennsylvania:													
Allegheny Arsenal	34.5	27.6	43.7	52.0	61.6	68.1	74.4	70.2	66.1	50.8	42.6	44.6	53.0
Altoona	37.1	29.8	42.7	52.4	64.1	69.6	74.6	70.5	64.4	51.2	45.8	44.0	53.8
Aunville	......	......	......	......	66.5	......	......	......	68.7	53.6	46.3	41.6	......
Aqueduct	[32.0]	[25.0]	46.2	58.3	67.0	70.4	75.0	67.1	63.7	49.4	43.5	39.4	[53.1]
Bethlehem	[33.0]	27.0	[41.0]	52.4	64.0	70.2	74.0	71.1	64.0	51.0	45.0	40.0	[52.7]
Blooming Grove	30.9	21.5	36.8	47.4	61.4	68.0	71.2	65.6	60.0	45.0	40.2	36.8	48.7
Blue Knob	[36.0]	[22.0]	[38.0]	44.2	57.8	64.5	71.5	62.6	60.6	43.8	36.1	37.8	[47.9]
Cannonsburgh	......	......	......	......	......	......	......	67.9	62.5	45.0	39.8	43.4	......
Carlisle	33.2	26.1	41.3	52.3	63.4	69.1	[74.0]	72.9	[63.5]	50.1	42.6	39.6	[52.3]
Catawissa	34.7	26.7	42.2	52.3	[63.0]	[68.0]	72.6	[69.5]	63.0	48.0	39.0	44.3	[51.9]
Chambersburgh	......	......	......	......	......	......	......	......	62.9	47.9	41.1	37.9	......
Charlesville	31.3	24.0	39.2	49.5	58.9	64.8	70.4	64.9	[63.0]	47.2	39.5	39.7	[49.4]

Clarion	*29.1*	*20.0*	*37.7*	*47.2*	*58.0*	*[67.0]*	*[70.0]*	*[67.0]*	*61.8*	*45.8*	*43.0*	*39.8*	*[48.9]*
Coatesville	*33.2*	*25.6*	*39.8*	*49.6*	*60.0*	*68.7*	*72.9*	*68.9*	*62.9*	*48.3*	*42.7*	*39.1*	*51.0*
Corry	29.2	18.4	34.3	44.1	55.9	63.2	68.1	64.0	61.0	43.0	39.1	37.3	46.5
Coudersport	28.6	17.8	[36.0]	47.1	59.7	65.2	67.2	65.6	60.5	[42.0]	41.5	[37.5]	[47.4]
Drifton	30.4	19.0	35.8	47.1	57.8	63.6	67.1	64.2	58.9	45.0	40.1	36.3	47.1
Dyberry	27.1	17.4	33.3	45.8	56.3	63.0	65.8	61.2	57.2	41.6	37.8	33.3	45.0
Eagle's Mere	26.6	12.0	33.4	42.3	57.3	[66.5]	67.5	64.8	58.2	41.7	37.3	33.1	[45.1]
Edinborough	28.4	17.4	34.3	43.4	58.8	63.2	71.2	66.0	60.3	43.0	39.0	36.8	46.8
Emporium	30.5	21.8	40.0	51.6	64.5	68.2	70.0	69.2	62.9	46.3	41.7	38.6	50.4
Erie	32.2	21.4	34.8	45.0	57.5	63.7	70.4	67.4	62.8	46.2	42.5	40.8	48.7
Forks of Neshaminy	[38.0]	[29.0]	40.4	50.5	62.0	66.5	[75.0]	70.1	61.9	49.8	43.4	40.2	[52.2]
Frankford Arsenal	35.8	26.0	41.1	52.4	63.2	71.6	74.5	71.3	66.1	52.0	45.4	43.2	53.6
Franklin	29.3	19.6	38.2	45.0	57.4	63.6	67.6	61.4	59.4	43.4	38.7	36.7	46.7
Germantown	35.8	25.8	39.2	49.8	63.7	71.7	73.6	70.6	64.8	49.3	45.6	41.8	52.6
Girardville	[32.0]	23.1	38.8	49.8	60.0	66.0	72.6	67.9	61.3	46.5	41.4	38.3	[49.8]
Grampian Hills	28.8	18.4	36.6	47.8	59.6	66.7	70.8	65.8	60.4	45.1	38.3	36.7	47.9
Greenville	28.7	19.1	[38.0]	44.1	56.3	63.5	68.8	63.6	59.3	42.2	41.5	39.5	[47.0]
Harrisburg	32.4	25.2	40.8	51.8	62.6	68.5	73.8	69.8	63.8	50.2	42.8	40.2	51.8
Hollidaysburgh	32.0	24.0	39.0	51.0	63.0	66.0	71.6	66.7	62.0	41.0	41.3	41.0	49.9
Honesdale	27.8	16.0	34.2	45.2	56.4	63.7	66.4	62.0	60.1	45.4	41.2	35.5	46.2
Huntingdon	32.5	24.0	38.9	50.0	60.7	65.2	70.3	67.6	62.6	46.5	40.6	39.9	49.9
Indiana	34.9	26.4	43.2	62.1	68.3	67.9	[72.0]	[67.0]	61.7	47.1	40.8	[40.0]	[52.6]
Johnstown	......	......	......	......	......	......	......	65.9	62.8	47.1	41.4	42.6	......
Kennett Square	......	......	......	......	......	......	......	......	62.8	50.0	44.0	38.8	......
Lancaster	34.9	26.4	40.4	51.7	62.5	......	......	......	62.8	49.7	43.2	......	......
Leroy	28.0	16.9	33.8	45.8	59.4	65.5	70.0	66.4	60.0	42.6	38.1	34.5	46.8
Lock Haven	32.0	22.0	39.2	50.5	......	......	......	......	62.9	......	43.0	37.9	......
Meshoppen	......	......	43.7	46.9	59.2	66.7	68.8	64.7	64.0	......	......	33.1	......
McConnellsburgh	33.6	26.4	40.0	51.5	62.1	66.2	72.0	[68.0]	[64.0]	48.2	41.4	41.1	[51.2]
Myerstown	......	......	......	......	60.4	66.3	......	68.7	61.9	47.8	41.5	37.7	......
New Bloomfield	31.7	22.3	38.9	50.1	62.1	66.2	72.7	67.2	61.3	47.4	41.0	39.0	50.0
New Castle	33.2	24.7	45.3	50.1	61.8	68.7	[75.0]	69.9	63.1	48.0	42.4	42.8	[52.1]
Nesbit	[30.0]	21.3	38.6	49.4	60.2	65.2	71.0	65.8	61.5	45.0	41.4	36.5	[48.8]
Petersburgh	[32.0]	[24.0]	38.6	49.6	59.8	65.4	70.1	66.0	61.1	46.3	41.4	39.5	[49.5]
Philadelphia	38.7	29.5	42.2	53.2	64.7	71.4	75.3	72.8	66.4	52.8	47.0	43.6	54.8
Philipsburgh	28.6	19.2	37.4	47.6	58.5	62.4	69.4	66.6	59.8	45.0	38.8	38.8	47.7
Pittsburgh	36.5	28.0	43.2	52.4	62.4	48.2	74.6	70.2	65.6	51.0	43.5	45.6	51.8
Pleasant Mount	[32.0]	14.3	31.1	43.9	57.5	64.6	69.6	65.0	59.2	42.2	36.5	31.2	[45.6]
Pottstown	35.0	23.5	43.0	51.0	63.0	71.3	74.4	72.0	65.0	51.0	46.0	42.0	53.1
Quakertown	32.4	24.3	38.5	49.4	60.7	67.2	70.8	67.7	61.6	47.4	42.4	37.9	50.0
Reading	33.2	26.6	41.6	49.3	62.8	70.0	73.6	69.2	63.6	49.8	42.8	39.5	51.8

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Pennsylvania—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Rimersburgh	30.0	20.2	38.0	47.7	62.0	68.2	75.0	67.7	61.9	46.0	39.4	40.1	49.1
Salem Corners	28.1	17.7	33.6	45.0	58.8	64.4	67.2	63.0	58.3	43.3	38.0	34.7	46.0
Selin's Grove	33.3	24.8	44.0	52.8	63.2	68.2	71.4	71.8	63.1	48.9	43.0	38.8	52.2
Smethport	30.0	20.8	......	......	57.4	67.4	......	......	......	......	......	......	......
Somerset	30.7	21.0	35.3	45.2	54.2	60.4	68.5	62.7	57.0	44.6	[41.0]	41.7	[46.9]
South Eaton	......	......	......	......	......	......	......	......	57.5	45.0	42.7	34.5	......
State College	30.6	21.8	38.2	49.2	61.0	64.9	70.9	65.9	60.6	46.0	39.5	38.6	48.9
Swarthmore	35.7	28.1	40.3	52.4	62.3	69.3	73.0	70.1	63.8	50.1	44.3	41.4	52.6
Tionesta	29.5	......	......	......	......	......	......	62.6	......	......	39.7	38.5	......
Tipton	......	......	......	50.6	61.6	65.7	......	......	......	46.6	40.9	39.5	......
Troy	30.0	20.1	35.6	45.8	58.5	64.6	69.4	64.6	61.4	42.9	39.9	36.2	47.4
Tuscarora	[33.0]	[25.0]	42.8	53.8	65.6	71.4	76.4	70.8	65.3	50.3	43.7	40.4	[53.2]
Uniontown	36.5	30.0	41.5	50.8	60.9	67.8	74.0	69.1	64.9	50.1	44.1	46.0	53.0
Wellsborough	30.0	18.8	35.7	44.2	55.3	64.6	68.6	62.3	58.8	41.2	38.3	35.0	46.1
West Chester	35.2	26.6	40.5	51.6	62.9	69.4	73.0	70.5	63.6	50.7	43.7	41.5	52.4
Westtown	35.8	28.4	......	......	......	......	......	......	......	50.2	44.0	42.2	......
Wilkesbarre	......	......	......	......	......	......	......	......	60.5	49.0	42.0	39.0	......
Wysox	30.0	17.1	36.2	47.0	58.9	69.0	69.2	64.4	60.2	43.7	39.0	35.7	47.5
York	[34.0]	[26.0]	[42.5]	50.2	63.2	66.5	74.5	70.2	63.4	49.9	43.1	40.6	[52.0]
Rhode Island:													
Block Island	36.1	27.0	37.2	44.1	53.8	62.9	67.6	67.2	63.0	51.2	46.6	41.4	49.8
Bristol	35.0	26.2	37.0	46.6	58.3	65.8	69.6	68.4	63.8	50.0	46.3	40.0	50.6
Fort Adams	[36.0]	25.0	40.1	49.3	54.2	62.7	67.9	68.4	62.4	52.2	46.0	39.4	[50.3]
Kingston (1)	[36.0]	[25.0]	[39.0]	45.9	56.2	64.5	67.9	66.1	61.6	48.4	43.5	39.4	[49.5]
Kingston (2)	......	......	......	......	......	......	65.7	66.7	61.8	47.9	42.8	37.0	......
Narragansett Pier	34.8	26.8	36.8	46.3	56.2	66.1	69.2	68.0	63.6	49.0	44.5	39.0	50.0
Newport	36.2	27.8	38.4	47.6	57.4	64.6	68.8	68.2	63.6	51.4	46.6	40.8	51.0
Olneyville	37.4	28.2	39.8	50.3	62.8	70.8	72.8	70.1	65.7	52.2	47.4	40.6	53.2
Providence (1)	35.7	26.4	38.7	49.0	61.0	69.7	71.2	68.2	63.2	49.4	45.3	39.2	51.4
Providence (2)	33.6	25.2	37.1	47.8	60.0	68.8	[70.0]	[68.0]	63.9	49.1	43.8	37.0	[50.4]
Woonsocket	32.1	24.0	37.0	47.9	61.3	[70.0]	70.6	67.1	62.1	47.1	43.1	35.3	[49.8]
South Carolina:													
Aiken	47.2	45.0	53.8	64.0	71.6	......	......	......	......	......	55.4	59.0	......
Allendale	......	......	......	......	72.8	76.6	81.6	78.0	74.0	62.8	57.0	......	......

South Carolina—Continued.													
Batesburgh	....	....	....	*67.7*	*72.5*	*76.8*	*77.8*	*74.2*	*70.8*	*61.5*	*54.7*	....	....
Belmont	*[42.0]*	*41.8*	*51.4*	*62.0*	*71.5*	*74.8*	*78.5*	*73.8*	*72.1*	*61.7*	*53.0*	*55.7*	*[61.5]*
Blackville	....	....	....	....	73.3	78.0	81.4	77.1	74.0	62.0	56.5	....	....
Branchville	....	....	....	....	71.6	75.4	79.9	77.2	73.4	60.6	56.4	....	....
Brewer Mine	46.2	51.0	40.9	64.9	69.5	69.5	77.0	68.5	73.0	60.0	53.3	54.1	60.6
Cedar Springs	40.8	38.4	47.9	60.0	67.4	72.3	76.6	72.5	67.3	56.6	49.6	51.3	58.4
Charleston	51.6	47.4	55.0	63.5	73.6	76.8	81.4	78.0	75.8	64.7	60.0	60.0	65.6
Cheraw	....	....	....	....	70.9	76.4	81.0	76.5	71.4	59.3	54.6	54.1	....
Chester	....	....	....	....	72.4	75.9	80.3	76.4	73.1	61.6	55.2	....	....
Clinton	43.2	40.7	51.7	58.5	69.5	74.0	80.5	75.0	70.1	57.5	51.2	55.0	60.6
Columbia (1)	44.7	41.9	50.8	61.1	71.1	....	....	....	....	57.1	52.5	53.5	....
Columbia (2)	45.1	44.0	54.1	64.7	73.0	76.8	80.5	76.7	73.2	62.9	56.1	58.0	63.8
Conway	49.5	[43.0]	53.3	62.0	70.2	68.5	78.5	74.5	71.0	63.5	56.5	55.7	[62.2]
Evergreen	42.5	35.5	....	62.0	72.0	72.3	78.0	73.5	....	....	....	53.3	....
Florence	43.1	[44.0]	54.6	[63.0]	74.9	77.6	81.6	77.0	73.0	60.8	56.4	[55.0]	[63.4]
Greenville	....	....	....	....	68.9	74.5	78.3	74.2	69.6	57.4	51.4	....	....
Greenwood	....	....	....	....	71.2	76.0	80.0	74.9	72.4	61.2	53.2	55.8	....
Hardeeville	....	....	....	....	73.2	76.9	82.3	78.0	74.8	62.7	57.8	57.2	....
Jacksonborough	....	....	....	....	72.9	75.7	74.8	76.7	73.2	60.6	55.6	....	....
Kingstree	....	....	....	....	71.5	75.8	79.6	74.7	72.6	62.8	56.6	....	....
Kirkwood	42.3	39.4	47.6	58.7	68.2	72.3	75.8	71.5	67.4	53.2	50.0	48.2	57.9
Port Royal	....	....	....	....	....	....	80.7	78.0	75.7	66.0	59.4	57.8	....
St. Georges	....	....	....	....	71.7	76.2	80.6	76.4	72.8	60.8	55.8	....	....
St. Mathews	....	....	....	....	72.3	75.1	80.0	76.2	73.2	62.8	56.2	....	....
Simpsonville	....	....	....	....	....	....	78.7	....	68.0	62.4	50.5	55.2	....
Spartanburgh	....	....	....	....	71.5	69.2	74.4	72.5	68.0	58.0	53.4	....	....
Statesburgh	46.8	43.3	52.2	61.5	71.9	74.1	77.9	73.5	70.9	60.4	54.3	56.6	62.0
Timmonsville	52.3	44.0	57.0	64.5	74.0	70.5	80.4	70.5	72.0	65.0	60.0	60.1	64.2
Trial	45.0	43.5	50.0	60.0	68.5	73.3	77.5	73.3	69.4	58.0	52.9	50.6	60.2
Winnsborough	43.8	41.9	51.6	61.2	72.7	70.5	78.7	73.7	70.8	61.3	53.7	55.2	61.3
Yorkville	45.0	42.0	52.0	63.0	70.0	73.0	78.0	84.0	71.0	61.0	54.2	57.0	62.5
South Dakota:													
Alexandria	....	....	....	....	....	66.8	72.4	71.7	58.1	....	28.9	30.2	....
Armour	....	....	....	....	60.0	67.6	71.6	71.0	....	....	....	....	....
Brookings	13.6	9.5	33.1	47.6	54.4	64.1	70.4	70.0	55.5	43.7	25.1	26.4	42.8
Canton	....	....	....	....	....	....	....	73.1	60.4	49.1	31.6	30.8	....
Clark	....	....	....	....	....	....	69.3	70.5	55.2	46.1	27.9	25.5	....
De Smet	[12.5]	4.3	31.6	46.6	55.0	66.0	69.1	70.1	43.2	41.5	22.8	23.4	[40.5]
Fort Bennett	17.9	14.4	39.8	53.2	55.8	69.0	71.9	73.4	58.9	49.7	23.9	25.2	46.1
Fort Meade	22.2	21.4	36.4	46.7	49.0	62.6	68.4	70.8	57.2	51.1	31.8	33.0	45.9

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
South Dakota—Continued.													
Fort Randall	20.4	19.0	41.9	55.1	61.0	70.8	74.9	70.0	60.5	51.0	31.2	35.1	49.2
Fort Sisseton	9.8	4.7	33.0	46.3	......	......	......	......	......	......	......	......	......
Fort Sully (1)	16.9	17.3	42.7	53.9	57.7	69.6	75.0	76.4	61.4	51.4	30.1	29.1	48.4
Fort Sully (2)	16.8	15.0	38.0	51.8	55.4	67.8	72.3	74.0	69.2	50.2	28.4	27.6	46.5
Garden City	12.0	8.8	25.4	46.1	53.2	......	......	......	......	......	......	......	......
Huron	12.7	10.6	36.3	49.6	54.8	66.4	70.9	71.6	57.2	46.8	28.2	26.4	44.3
Kimball	13.2	10.8	33.0	47.4	54.2	67.6	70.6	69.8	55.5	43.8	23.8	25.6	42.9
Oneida	[16.0]	[10.0]	33.8	45.3	48.3	64.8	70.6	74.2	55.5	45.8	24.7	24.2	[42.8]
Parkston	16.5	14.5	35.4	[50.0]	[57.0]	64.8	68.4	69.5	54.6	43.7	24.3	32.2	[44.2]
Rapid City	22.8	21.0	39.8	49.8	52.2	64.6	69.3	72.0	58.2	51.4	32.8	35.2	47.4
Roscoe	......	......	......	......	51.4	64.8	68.7	70.0	53.6	45.2	......	......	......
Spearfish	24.5	22.7	39.3	50.2	55.0	68.7	70.5	74.4	57.0	51.0	33.2	34.2	48.4
Spring Lake	16.1	15.2	34.2	47.7	53.6	65.7	69.3	69.5	......	......	......	......	......
Webster	10.9	6.9	33.9	48.7	55.1	66.3	71.0	73.5	59.1	48.3	29.2	27.2	44.2
Wolsey	11.0	8.8	33.2	47.6	54.6	67.3	74.1	71.2	55.0	43.8	23.4	21.6	42.6
Woonsocket	12.3	10.2	34.4	49.1	55.8	67.4	70.9	71.9	55.9	44.2	25.0	25.8	43.6
Yankton	20.0	18.4	39.2	52.4	59.5	69.0	73.2	73.4	60.7	50.4	32.4	34.4	48.6
Tennessee:													
Andersonville	[41.0]	39.0	49.0	59.2	63.3	69.2	75.4	71.0	65.2	55.5	45.5	53.5	[57.2]
Arlington	......	......	......	......	68.4	72.8	77.9	74.3	68.4	57.0	45.6	......	......
Ashwood	41.2	39.8	50.8	60.4	65.3	71.9	77.0	73.8	67.9	56.6	47.2	57.2	59.1
Austin	40.4	39.1	50.2	60.8	66.6	73.4	79.3	75.8	69.7	56.7	49.6	56.5	59.8
Bolivar	......	......	......	......	69.9	77.7	78.7	82.3	75.0	59.6	......	60.4	......
Chattanooga	42.6	41.7	51.6	62.2	66.2	72.2	78.4	74.7	69.1	58.4	50.1	57.2	60.4
Clarksville	39.3	37.5	50.0	60.6	66.7	72.2	77.8	75.2	67.8	56.1	46.7	55.2	58.8
Cog Hill	[41.0]	34.6	44.3	57.3	60.1	72.8	[77.5]	76.7	72.5	57.0	51.9	[55.0]	[58.4]
Covington	......	......	......	......	......	73.2	79.5	76.2	68.2	57.7	46.2	......	......
Cumberland Gap	......	......	......	57.9	60.8	66.3	73.4	......	......	......	......	51.4	......
Dunlap	......	......	......	......	......	76.5	77.1	74.3	69.3	58.7	51.4	......	......
Fayetteville	42.3	41.6	51.5	60.7	65.8	72.8	77.2	74.8	70.0	58.9	49.5	57.6	60.2
Florence Station	40.9	39.6	49.8	61.2	66.3	71.9	76.7	73.8	67.2	56.3	47.8	55.3	58.9
Fostoria	40.2	......	......	......	......	67.8	70.3	68.2	62.6	......	......	......	......
Greeneville	38.5	35.9	45.9	56.1	60.4	66.8	73.2	69.1	64.3	52.2	45.8	50.3	54.9

Grief	....	....	....	....	....	....	*77.8*	*72.5*	*69.0*	*58.6*	*47.7*	....	....
Hohenwald	*39.9*	*38.0*	*49.0*	*59.9*	*66.0*	*69.3*	*75.7*	*71.0*	*63.9*	*52.2*	*45.2*	54.8	57.1
Jacksonborough	*39.0*	*37.3*	*48.0*	*58.6*	*62.9*	*69.7*	*75.7*	*71.6*	*65.0*	54.9	46.5	51.9	56.8
Kingston Springs	*40.0*	*37.4*	*48.3*	*59.7*	*67.0*	*70.1*	*76.2*	*72.3*	65.5	54.5	45.6	52.7	57.4
Knoxville	*40.8*	38.8	48.6	59.6	64.4	70.7	77.2	73.2	67.5	55.4	47.8	54.1	58.2
Lawrenceburgh	38.3	38.0	46.8	57.9	63.6	70.9	....	....	63.4	....	....	....	....
Leeville	40.6	39.0	51.0	62.8	67.5	72.5	78.3	75.8	69.7	59.0	47.4	56.3	60.0
Lewisburgh	38.2	....	....	....	64.5	71.6	76.6	73.9	67.0	....	47.3	55.0	....
Lookout Mountain	39.7	37.7	49.6	59.0	64.1	69.8	74.6	71.7	66.8	57.3	[50.0]	[56.0]	[58.0]
Lynnville	....	....	....	....	....	....	....	72.2	64.5	50.3	45.6	55.5	....
McKenzie	42.2	40.0	52.8	[60.0]	[64.0]	73.9	79.9	78.0	71.6	58.6	49.0	60.0	[60.8]
McMinnville	....	....	....	59.7	60.7	71.5	73.9	71.5	65.4	53.1	46.9	....	....
Memphis	42.9	42.8	54.0	63.9	69.8	74.6	80.6	77.4	71.4	60.8	48.4	60.2	62.2
Milan (1)	....	....	....	....	70.2	73.8	80.0	76.0	69.2	57.6	46.8	....	....
Milan (2)	39.5	36.1	50.2	60.4	66.3	71.6	77.6	74.5	67.4	56.0	46.0	56.7	58.5
Nashville	40.0	37.8	50.4	60.0	65.8	72.1	78.2	75.0	68.6	57.2	47.7	56.4	59.1
Nunnelly	40.7	38.6	49.6	59.3	63.9	69.9	75.1	72.8	65.9	53.2	44.2	57.4	57.6
Parksville	43.7	40.3	49.2	60.4	64.4	70.3	75.2	73.0	67.1	56.0	48.3	55.4	58.6
Riddleton	40.5	37.5	46.2	37.3	61.9	71.3	76.3	72.8	66.6	55.4	47.6	52.4	55.5
Rogersville	38.7	36.7	47.6	56.4	64.2	70.1	77.4	71.7	66.3	53.4	45.2	48.4	56.3
Rugby	....	....	....	....	63.3	68.8	74.3	70.5	63.7	51.2	44.2	50.8	....
Savannah	43.2	43.4	[51.0]	61.5	66.2	73.3	78.2	75.7	68.2	60.0	50.7	57.0	[60.7]
Springdale	33.8	38.2	48.6	59.9	[62.0]	71.4	77.6	72.1	65.9	54.8	47.3	52.4	[57.0]
Trenton	39.1	38.2	49.0	58.6	64.2	[73.0]	76.3	73.1	66.3	55.0	44.9	55.7	[57.8]
Tullahoma	....	....	....	61.4	....	71.4	76.9	73.6	63.9	57.2	45.7	53.9	....
Watkins	39.1	37.1	49.6	62.0	64.0	73.2	78.8	78.0	71.2	58.0	48.7	57.2	59.7
Waynesborough	40.8	39.5	48.0	60.2	61.0	70.0	75.3	72.2	67.0	53.7	45.7	56.0	57.4
Woodstock	....	....	....	66.7	71.2	75.9	81.7	78.2	70.0	....	....	....	....
Texas:													
Abilene	43.3	45.9	54.6	66.4	71.5	74.9	80.2	80.9	69.8	65.2	47.8	59.6	63.3
Austin (1)	49.8	54.4	59.2	69.9	73.4	79.8	84.4	83.6	75.8	68.6	55.4	65.5	68.3
Austin (2)	....	....	....	70.2	73.2	78.6	82.6	....	....	69.4	53.8	65.4	....
Belton	44.0	50.9	[58.0]	69.9	72.4	76.4	84.3	82.4	74.4	68.9	53.2	[65.5]	[66.7]
Brownsville	59.2	62.7	65.6	74.4	76.4	82.0	84.2	82.5	77.3	75.6	64.6	71.1	73.0
Brownwood	44.9	48.0	55.4	68.4	72.0	77.8	82.6	82.9	71.3	65.6	48.8	60.6	64.9
Brady	44.1	47.9	54.0	66.0	70.8	75.7	79.4	80.8	68.6	64.7	50.1	60.7	63.6
Brazoria	52.6	55.1	58.4	69.1	72.9	78.2	81.1	78.5	74.5	67.5	54.6	63.2	67.1
Brenham	52.4	56.3	61.2	72.4	75.3	81.0	85.0	84.8	76.1	71.5	57.0	66.8	70.0
Burnet	....	....	....	....	66.0	76.0	....	....	70.0	68.0	....	....	....
Camp Eagle Pass	52.5	56.7	60.9	69.9	77.8	85.0	84.6	84.4	~~75.3~~	69.8	56.7	66.0	70.0
Camp Peña Colorado	34.0	42.5	[55.0]	[67.0]	73.7	71.3	79.4	76.2	68.6	62.3	48.2	53.0	[60.9]

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Texas—Continued.	°	°	°	°	°	°	°	°	°	°	°	°	°
Cedar Hill	48.0	......	57.2	69.2	72.1	76.2	83.1	......	......	......	......	......	......
Cleburne	45.7	47.4	56.7	68.0	72.1	77.4	82.6	79.0	68.8	61.6	44.6	[53.0]	[63.1]
College Station	48.4	51.5	60.2	68.2	71.8	80.6	85.8	82.4	76.1	71.4	57.0	66.6	68.3
Colorado	......	......	......	67.8	74.3	......	......	81.3	71.6	66.5	49.8	59.4	......
Columbia	53.3	55.9	60.8	71.4	74.4	79.8	83.2	84.2	76.6	69.8	56.6	66.6	69.4
Corpus Christi	55.1	57.0	61.3	71.5	73.9	79.5	82.2	80.8	75.9	73.0	60.1	68.4	69.9
Corsicana	57.7	51.0	59.0	70.4	72.7	77.4	82.6	79.6	73.2	70.2	52.2	62.1	67.3
Cuero	......	......	......	......	79.8	83.8	83.8	82.1	71.8	71.0	60.7	......	......
Dallas	......	......	......	......	73.1	78.9	84.9	82.4	74.8	69.7	52.1	61.4	......
Decatur	43.5	44.4	54.8	66.8	66.8	73.1	79.9	78.4	69.4	64.9	47.3	59.6	62.4
Duval	......	......	......	......	......	81.0	86.1	85.5	71.2	70.0	54.6	53.3	......
El Paso	41.5	47.8	53.9	67.0	73.5	80.8	83.0	82.7	71.4	65.0	49.0	53.2	64.1
Epworth	......	......	......	......	......	......	......	......	72.0	68.4	44.2	53.3	......
Forestburgh	[43.0]	[47.0]	54.0	45.1	72.8	75.2	80.5	78.0	73.3	67.0	55.8	62.5	[62.9]
Fort Bliss	40.8	47.4	53.4	67.0	73.5	80.7	83.6	83.1	71.7	65.3	48.5	53.1	64.0
Fort Brown	57.1	62.6	65.2	74.2	75.8	81.9	83.8	81.3	77.4	74.9	64.2	70.2	72.4
Fort Clark	44.5	50.1	53.9	64.9	75.2	82.1	81.2	81.4	72.0	67.7	59.0	68.4	66.7
Fort Concho	46.3	50.1	57.2	69.2	74.6	......	......	......	......	......	......	......	......
Fort Davis	39.2	45.8	50.1	63.6	69.9	72.6	75.8	77.2	65.5	69.2	49.5	56.5	61.2
Fort Elliott (1)	34.4	37.4	50.0	61.4	66.9	72.0	80.0	78.6	68.3	59.5	41.6	51.8	58.5
Fort Elliott (2)	33.7	35.2	48.1	59.2	65.8	71.4	79.4	78.0	67.8	58.4	40.0	51.9	57.4
Fort Hancock	41.4	47.2	52.3	69.6	70.2	77.3	82.6	78.9	65.5	60.7	43.0	46.5	61.3
Fort McIntosh	[53.0]	58.9	63.8	73.8	78.7	84.6	86.2	84.9	75.7	70.2	56.6	65.6	[71.0]
Fort Ringgold	57.5	61.5	64.8	76.7	79.0	85.7	83.4	84.6	77.2	74.2	60.7	70.9	73.0
Fort Worth	45.6	47.0	55.9	67.8	69.1	85.7	79.8	81.9	72.9	67.5	51.0	60.4	65.4
Fredericksburgh	......	......	......	......	69.0	75.0	79.0	77.5	69.6	65.3	50.4	61.2	......
Gainesville	......	43.9	......	......	69.0	74.6	78.8	......	70.5	......	......	......	......
Gallinas	50.7	54.3	58.2	67.7	72.3	80.0	82.0	81.3	72.9	69.0	54.3	65.8	67.4
Galveston	52.8	54.4	60.0	70.2	73.7	79.0	83.8	81.5	77.5	72.2	59.6	66.4	69.3
Graham	......	......	......	......	......	75.8	83.1	82.0	69.8	63.5	45.2	56.0	......
Hartley	......	......	......	......	......	......	75.9	86.2	73.9	62.3	35.2	50.4	......
Hearne	......	......	......	......	72.2	77.0	80.8	79.5	72.6	68.6	51.5	61.4	......
Howe	[46.0]	[47.0]	54.7	65.6	69.3	73.6	79.4	77.6	69.8	65.0	47.3	59.0	[62.9]

Houston	*51.2*	*55.2*	*[60.0]*	*73.0*	*73.6*	*79.6*	*84.5*	*81.2*	*75.7*	*69.3*	*54.4*	*65.7*	*[68.6]*
Huntsville	*49.8*	*53.6*	*58.5*	*[69.0]*	*73.4*	*79.8*	*84.8*	*81.9*	*75.6*	*70.6*	*54.4*	*64.7*	*[68.0]*
La Grange	*51.7*	*55.7*	*60.6*	*71.2*	*70.0*	*74.7*	*81.4*	*76.2*	*74.6*	*70.2*	*57.0*	*67.8*	*67.6*
Lampasas	46.8	51.3	57.9	69.0	71.8	76.9	81.6	81.5	73.0	67.0	51.6	62.7	65.9
Longview	48.2	50.6	58.3	68.3	72.4	77.7	83.9	80.0	74.0	66.6	51.6	62.8	66.2
Luling	51.1	53.2	59.4	71.1	69.3	80.4	83.0	82.6	75.3	70.1	54.7	[66.0]	[68.0]
Menardville	....	....	....	....	73.3	75.6	....	78.4	68.2	64.0	48.2	58.6	....
Merkel	....	....	....	68.1	70.8	74.7	78.0	83.6	67.7	62.3	....	56.6	....
Mesquite	45.7	47.5	56.7	68.2	71.9	76.6	83.4	80.9	73.0	66.4	49.9	62.2	65.2
New Braunfels	51.4	52.2	55.4	62.2	72.2	77.5	84.1	82.3	73.5	64.4	50.3	64.4	65.8
New Ulm	51.4	55.0	59.9	69.9	73.1	77.4	81.3	81.1	74.6	70.5	55.4	65.8	68.0
Palestine	49.0	51.9	58.6	68.8	71.4	76.6	83.1	81.8	71.9	66.5	51.2	64.0	66.2
Panhandle	....	....	....	....	....	....	....	76.6	65.0	62.8	37.4	52.1	....
Panter	47.0	43.2	51.5	65.0	72.2	77.0	82.6	82.3	73.2	66.4	46.3	62.5	64.0
Pecos City	[45.0]	[48.0]	51.9	60.8	69.2	70.5	73.0	76.6	68.6	63.1	45.4	[55.0]	[60.6]
Rio Grande City	56.9	61.5	64.5	76.0	78.2	84.6	87.8	86.4	78.4	75.5	62.8	71.2	73.6
Round Rock	....	....	....	....	....	....	....	....	74.7	69.8	54.0	68.2	....
Silver Falls	38.4	41.0	50.4	62.3	72.9	71.8	76.1	79.1	70.7	63.1	45.3	56.1	60.6
San Antonio (1)	51.6	55.0	59.5	69.6	75.7	83.5	85.9	82.8	69.9	68.1	57.5	67.7	68.9
San Antonio (2)	51.6	55.0	59.4	69.0	72.6	79.0	81.7	80.7	73.6	69.4	55.8	66.0	67.8
Snyder	....	33.0	....	56.3	63.8	51.2	76.6	76.2	64.0	57.9	....	....	....
Tyler	47.2	[55.0]	[59.0]	[69.0]	71.9	78.5	83.7	78.5	73.8	65.5	51.2	65.0	[66.5]
Waco	48.1	52.1	58.7	69.9	73.3	78.8	84.7	83.3	74.0	67.1	52.4	62.4	67.1
Weatherford	....	....	....	....	71.8	75.4	83.6	78.6	71.7	....	....	....	....
Utah:													
Beaver	....	....	....	....	54.6	62.8	71.1	69.5	59.8	51.4	35.3	38.0	....
Blue Creek	19.5	27.6	47.0	61.6	66.9	82.8	88.4	83.1	66.4	52.7	38.3	36.0	55.9
Corinne	18.9	28.3	48.2	57.4	63.0	74.9	83.5	81.3	62.4	52.9	36.0	35.3	53.5
Fort Douglas	21.0	29.0	48.2	53.7	58.1	71.8	81.2	77.9	61.5	54.0	38.8	39.7	52.9
Fort Du Chesne (1)	6.5	14.5	41.8	51.9	56.3	66.7	72.8	71.6	58.1	49.0	29.6	33.2	46.0
Fort Du Chesne (2)	6.8	15.4	42.5	52.6	57.0	67.6	73.2	72.2	59.3	48.8	29.9	33.2	46.5
Kelton	17.9	27.7	46.7	55.3	64.7	77.4	85.0	81.2	60.9	55.7	35.1	35.3	53.6
Losee	....	....	....	....	65.1	66.1	73.0	70.0	58.4	48.3	33.3	34.3	....
Mount Carmel	....	....	....	....	....	....	75.2	69.5	55.7	48.2	33.4	35.6	....
Mount Pleasant	....	....	....	....	....	....	....	59.1	45.2	42.6	27.7	29.1	....
Nephi	....	....	....	....	57.9	68.2	77.8	76.8	59.5	51.0	34.8	37.1	....
Ogden	19.5	30.6	46.5	54.2	61.3	70.8	80.6	77.6	59.3	49.6	37.9	41.0	52.4
Promontory	26.6	26.0	44.2	54.1	56.3	66.9	79.0	75.7	60.1	51.8	35.8	33.9	50.9
Richfield	....	....	....	....	....	....	....	70.2	57.8	51.4	34.7	37.0	....
Salt Lake City	21.4	29.8	47.7	55.2	58.8	70.3	78.4	77.4	60.6	54.2	39.0	39.6	52.7
St. George	....	....	....	....	....	80.6	88.3	85.7	72.8	61.6	46.6	46.8	....

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
Utah—Continued.													
Taylor's Ranch	35.6	29.3	....	....	....	....	74.8	72.4	59.4	49.3	31.0	32.6	....
Terrace	18.1	26.0	51.3	56.2	63.6	76.5	85.0	81.0	61.5	57.5	41.6	34.2	54.6
Vermont:													
Brattleboro (1)	29.0	19.4	35.8	49.4	59.8	66.8	69.6	66.7	66.4	45.8	40.0	31.7	48.4
Brattleboro (2)	28.8	18.1	36.1	48.9	59.5	64.9	67.0	64.2	60.4	45.2	41.0	31.9	47.2
Burlington	26.8	19.0	33.4	47.2	63.9	65.7	70.2	70.9	68.1	42.2	40.4	32.0	48.3
Chelsea	24.1	14.5	29.8	42.8	55.2	59.8	63.2	59.9	55.4	39.8	34.2	26.2	42.1
Coventry	22.9	12.6	28.7	39.4	54.6	66.3	....	....	....	....	....	....	....
East Berkshire	22.5	14.4	26.2	44.8	55.9	62.3	67.3	64.0	58.8	39.9	35.3	24.9	43.0
Hartland	....	....	....	....	....	....	....	....	60.0	44.1	38.1	28.6	....
Jacksonville	25.8	15.8	32.8	44.7	53.9	63.4	66.8	61.4	58.4	41.1	36.3	29.0	44.1
Lunenburgh	28.0	14.8	30.9	45.2	59.9	68.1	68.4	67.8	61.1	43.4	38.0	24.5	45.8
Manchester	28.3	[15.0]	[30.5]	[45.5]	60.1	66.0	68.6	64.5	60.5	43.6	39.4	32.7	[46.2]
Northfield	23.7	11.6	29.5	43.4	55.9	62.5	65.0	61.3	57.4	40.3	35.8	26.6	42.8
St. Johnsbury	21.7	12.0	28.0	42.1	57.6	62.8	65.0	60.6	56.0	39.2	35.6	23.9	42.0
Saxton's River	26.1	15.2	32.4	46.1	56.6	....	....	....	....	43.2	37.6	....	....
Strafford	25.4	14.2	32.6	46.5	60.8	66.8	68.3	65.9	61.1	43.6	37.1	28.8	45.9
Vernon	29.3	20.9	36.4	49.8	61.3	67.9	69.7	65.4	61.7	45.8	41.2	32.3	48.5
Virginia:													
Alum Springs	....	....	....	54.0	62.4	67.2	71.2	....	....	....	....	....	....
Birdsnest	41.2	33.9	43.2	54.5	66.1	73.6	78.6	74.4	68.2	56.6	51.6	49.1	57.6
Bolar	[37.0]	[31.0]	[43.0]	48.6	55.7	58.0	65.6	63.4	57.6	44.2	38.2	41.2	[48.6]
Cape Henry	45.0	39.7	44.4	55.3	61.8	73.5	77.1	74.1	68.6	57.4	54.1	52.4	58.8
Christiansburgh	37.1	[31.0]	39.8	49.5	57.3	66.0	72.6	68.8	62.7	51.8	44.8	46.5	[52.3]
Dale Enterprise	41.4	31.5	46.6	57.9	67.1	72.8	75.2	72.7	66.2	52.8	46.0	49.0	56.6
Fort Monroe	41.4	36.2	43.8	55.3	67.0	74.2	77.8	75.3	68.2	57.5	52.4	48.5	58.1
Fort Myer	37.7	29.8	43.0	54.1	64.3	70.2	75.1	72.1	64.5	52.3	45.5	45.8	54.5
Lexington	....	....	....	....	....	67.0	71.2	70.2	66.9	50.7	45.2	48.4	....
Lynchburgh	41.2	34.8	46.7	57.0	66.0	71.7	76.2	72.4	66.7	54.4	48.2	50.6	57.2
Marion	34.8	31.0	41.6	52.5	58.5	66.0	72.0	68.0	64.0	51.0	44.5	48.0	52.7
Middletown	....	....	....	....	....	....	....	70.4	60.0	54.6	46.4	42.8	....
Mossing Ford	....	....	....	....	....	....	....	69.9	....	52.2	47.5	46.7	....
Norfolk	44.4	38.2	45.0	56.8	68.1	73.9	77.6	74.4	68.4	57.7	53.4	51.4	59.1

Nottoway Court House	....	....	....	....	....	....	....	*71.9*	*70.9*	*59.6*	*48.8*	*49.4*	....
Petersburgh	*40.0*	*34.8*	*43.1*	*55.4*	*65.2*	*71.6*	*76.0*	*73.0*	*66.6*	*54.5*	*49.4*	*47.8*	*56.4*
Richmond	....	....	....	....	....	....	....	....	*67.5*	*55.7*	*50.8*	*51.2*	....
Smithfield	43.2	36.7	44.2	46.2	64.8	72.2	75.3	72.2	66.8	56.3	51.8	48.9	57.4
Spottsville	41.8	35.4	43.8	46.2	66.0	72.8	76.2	72.8	66.2	55.4	50.0	47.6	57.0
Summit	36.0	29.9	40.5	52.4	62.0	69.0	72.7	69.7	63.0	49.9	43.3	44.2	52.7
Wytheville	36.0	31.5	43.8	....	59.2	59.4	62.9	56.8	49.9	....	....	....	....
Washington:													
Blakeley	38.0	42.3	49.3	51.0	57.8	60.0	64.5	63.0	56.7	53.4	45.8	37.8	51.6
Fort Canby (1)	42.4	45.2	51.2	51.0	55.1	56.6	58.3	57.6	57.8	56.3	50.1	41.2	51.9
Fort Canby (2)	....	....	....	....	....	....	....	59.0	61.2	58.0	53.2	43.2	....
Fort Spokane	22.5	28.1	52.0	54.0	57.2	67.4	73.1	68.1	58.9	53.4	38.0	26.3	49.9
Fort Townsend	38.3	42.8	49.4	52.4	57.0	60.7	61.4	59.2	55.5	52.5	45.0	37.2	51.0
Fort Walla Walla	29.3	36.8	52.1	56.0	61.3	69.0	76.7	61.6	63.0	55.2	41.6	31.3	52.8
Neah Bay	42.2	44.1	49.6	51.8	54.7	57.7	59.2	58.3	55.4	54.0	48.0	39.4	51.2
Olympia	37.6	43.6	49.8	52.8	57.2	61.0	64.9	60.7	56.2	54.0	46.0	36.9	51.7
Port Angeles	37.5	40.6	45.6	48.0	52.2	55.0	56.4	55.2	51.2	49.6	43.3	36.3	47.6
Pysht	36.9	39.5	46.6	48.6	53.5	56.2	58.2	56.6	52.1	51.1	43.9	[38.0]	[48.4]
Spokane Falls	24.2	29.0	46.8	52.8	59.0	65.2	72.0	65.2	56.8	52.4	37.7	28.2	49.1
Tatoosh Island	43.6	45.0	49.6	....	....	....	....	....	54.2	54.1	49.2	40.8	....
Vancouver Barracks	38.4	42.1	50.3	53.4	60.4	69.6	70.7	64.6	60.4	56.4	40.3	36.4	53.6
Vashon	38.1	43.2	49.5	50.8	54.5	61.8	62.1	62.3	61.4	57.4	48.7	38.2	52.3
Walla Walla	28.7	35.8	53.0	57.0	61.8	70.5	78.0	72.2	63.5	56.2	43.0	32.0	54.3
West Virginia:													
Clarksburgh	32.1	31.1	38.4	....	....	....	....	66.2	66.7	....	....	....	....
Ella	....	....	....	....	62.9	66.0	73.2	68.6	62.0	48.2	41.6	44.4	....
Kingwood	....	....	....	....	63.2	67.8	71.5	65.8	60.7	48.5	38.9	41.4	....
Parkersburgh	36.4	30.0	43.2	52.6	62.4	68.4	74.2	70.1	64.0	50.0	43.5	47.2	53.5
Pleasant Hill	....	....	....	....	63.6	66.8	69.3	64.7	60.0	47.5	37.0	41.8	....
Rivesville	....	....	....	....	64.6	68.6	73.5	68.5	....	....	....	....	....
Rowlesburgh	....	....	....	....	....	68.9	71.2	67.3	61.3	45.0	39.6	39.0	....
Seven Pines	....	....	....	....	61.1	67.8	74.4	69.0	63.8	50.0	43.0	45.5	....
Tannery	....	....	....	....	....	70.1	73.3	74.2	67.8	45.3	38.8	46.4	....
Tyler's Creek	35.8	29.3	41.8	59.4	57.8	70.2	78.3	70.7	65.1	55.4	40.5	51.1	54.6
Wisconsin:													
Cadiz	20.2	15.5	36.0	45.8	56.1	64.6	70.1	66.4	57.6	42.0	32.6	34.8	45.1
Delavan	23.6	15.3	36.3	47.1	55.4	....	....	....	....	43.6	33.3	35.2	....
Embarrass	21.1	10.3	35.8	48.1	56.4	63.2	70.0	68.6	60.9	43.2	30.9	30.6	44.9
Fond du Lac	23.8	12.2	35.0	46.2	55.2	62.0	68.6	67.0	59.6	41.8	31.0	32.8	44.6
Fredonia	22.8	14.2	34.2	41.7	53.2	....	....	....	....	....	....	....	....

TABLE OF MONTHLY AND ANNUAL MEAN TEMPERATURES FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
Wisconsin—Continued.													
Friendship	......	......	......	47.6	55.3	64.2	71.0	67.4	58.2	42.8	......	......	......
Glasgow	[20.0]	8.2	35.6	46.1	53.4	64.6	68.6	67.7	57.4	39.8	[30.0]	29.6	[43.4]
Grantsburgh	[20.0]	[9.0]	[35.0]	49.0	61.6	64.3	69.3	66.2	56.0	44.5	29.1	27.8	[44.3]
Green Bay	20.2	10.6	34.0	45.7	54.0	60.4	68.6	67.4	60.0	43.2	32.3	31.2	44.0
Greenwood	......	......	......	......	53.4	61.5	69.0	64.6	52.4	40.0	27.6	29.0	......
Hayward	......	......	29.8	41.7	52.6	70.6	67.6	69.7	62.6	39.8	......	......	......
Honey Creek	......	......	......	......	......	......	......	73.6	63.2	48.4	35.0	35.8	......
La Crosse	20.4	12.0	39.0	49.0	57.0	64.4	72.0	70.2	60.6	45.2	32.0	33.8	46.3
Lincoln	21.8	[12.5]	34.6	45.3	54.1	61.8	69.2	68.1	61.4	43.2	35.8	38.4	[45.5]
Madison	22.6	14.1	37.1	47.9	55.4	63.5	71.0	70.0	61.2	46.2	33.4	35.0	46.4
Manitowoc	27.0	17.9	37.5	46.2	54.8	60.1	68.1	67.6	59.7	45.4	36.2	36.4	46.4
Milwaukee	26.2	16.2	36.6	45.2	53.5	58.6	67.8	68.8	59.8	47.1	36.4	37.0	46.1
Neilsville	......	......	33.2	......	......	68.0	79.7	67.4	56.5	38.8	25.7	27.4	......
Oshkosh	19.6	10.4	35.0	45.4	55.7	63.3	......	......	......	......	34.6	34.0	......
Richland Centre	[22.0]	[11.0]	36.2	48.5	56.6	64.3	71.4	68.0	58.8	43.7	31.0	32.8	[45.4]
Summit Lake	[16.0]	[8.0]	28.2	41.1	50.4	60.1	69.6	63.7	55.2	38.4	27.2	26.2	[40.3]
Viroqua	[20.0]	[9.5]	32.2	42.2	53.7	63.0	71.4	69.8	56.9	40.6	27.2	28.4	[42.9]
Waucousta	19.0	9.8	31.9	42.5	51.8	57.5	64.4	63.4	56.9	40.0	30.0	30.6	41.5
Wausau	......	......	......	......	......	66.2	69.3	65.6	57.8	39.6	27.4	26.4	......
Wauzeka	......	......	......	......	......	......	......	81.2	61.3	45.0	34.4	33.8	......
Weston	17.0	7.8	32.2	44.3	54.1	63.8	69.3	66.4	......	......	......	......	......
Wyoming:													
Camp Pilot Butte	13.8	25.7	37.2	46.6	52.8	66.0	72.6	71.3	54.8	43.1	25.2	27.9	44.8
Camp Sheridan	14.7	19.5	36.1	42.8	46.8	57.4	62.6	64.0	49.6	44.5	27.1	25.2	40.9
Cheyenne	24.7	24.8	38.4	45.6	49.5	59.0	68.2	68.1	55.0	48.1	30.2	36.5	45.7
Fort Bridger	13.9	24.6	36.2	46.2	[52.0]	[60.0]	67.2	65.4	53.3	43.9	26.1	24.6	[42.8]
Fort D. A. Russell	21.7	20.7	30.0	44.6	47.1	56.2	68.2	68.0	53.3	49.2	29.0	34.0	43.5
Fort Laramie (1)	24.2	24.2	41.8	50.8	54.2	64.8	......	......	......	......	......	......	......
Fort Laramie (2)	23.6	25.0	42.0	51.3	[53.0]	65.4	72.1	70.8	57.2	50.1	30.8	37.5	[48.2]
Fort McKinney (1)	25.0	24.8	42.0	50.0	51.6	63.1	68.5	70.4	55.5	47.2	32.5	34.5	47.1
Fort McKinney (2)	24.6	23.8	41.2	47.5	49.6	61.2	67.2	69.6	55.2	51.4	33.1	35.4	46.6
Fort Washakie (1)	8.7	17.2	38.6	46.6	50.5	60.8	68.7	67.3	52.9	47.2	28.0	29.6	43.0
Fort Washakie (2)	9.4	16.4	37.0	46.0	50.2	59.6	67.4	67.3	53.6	46.7	27.2	30.5	42.7
Lusk	[24.0]	22.3	39.0	47.2	51.4	62.4	72.3	68.0	54.5	45.6	29.9	35.3	[46.0]

APPENDIX 12—Continued.

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND ANNUAL RANGE OF TEM OBSERVERS, VOLUNTARY AND STATE WEATHER SERVICE OBSERVERS, UNITED SOCIETY AND OPERATORS AND AGENTS OF THE PACIFIC RAILWAY SYSTEM.

[NOTE—Letters of alphabet denote number of days missing from

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°
Alabama:										
Auburn	67	23	75	18	76	30	82	38	89	45
Bermuda	66	24	78	20	80	31	85	38	90	45
Butler	69	24	75	9	....	....	85	42	....	....
Citronelle	73	27	75	22	82	36	91	43	95	42
Columbiana	....	....	....	....	....	....	75	42	91	27
Decatur (2)	....	....	....	....	....	....	....	....	94	31
Elkmont	....	....	g75	g22	78	28	85	40	95	37
Eufaula	....	....	....	....	....	....	....	....	91	42
Evergreen	....	....	....	....	....	....	....	....	....	....
Fayette C. H	....	....	....	....	....	....	....	....	....	....
Florence	58	19	72	18	76	33	79	41	86	46
Fort Deposit	....	....	....	....	....	....	....	....	93	42
Gadsden	62	19	70	13	78	28	85	34	92	38
Greensborough	66	26	80	20	82	34	84	42	90	42
Livingston (1)	67	26	79	20	80	33	83	40	91	42
Livingston (2)	....	....	....	....	....	....	....	....	f90	f41
Marion	....	....	....	....	....	....	....	....	91	37
Mobile	69	31	70	29	77	38	85	44	85	46
Montgomery	70	26	80	21	82	33	87	41	92	44
Motes	66	17	73	11	80	26	88	39	87	38
Mount Vernon Barracks	71	24	76	22	83	33	90	42	93	42
Mount Willing	....	....	....	....	79	35	89	31	88	45
New Market	61	18	78	9	76	23	83	30	89	37
Opelika	....	....	....	....	....	....	....	....	94	44
Pine Apple	....	....	....	....	....	....	....	....	96	40
Selma (1)	72	26	....	....	....	....	....	....	93	43
Talladega	64	21	76	15	79	28	82	36	88	42
Tuscaloosa	66	21	75	14	75	26	80	37	87	41
Tuscumbia (1)	63	21	74	15	85	27	85	41	92	45
Tuscumbia (2)	....	....	....	....	....	....	....	....	91	32
Union Springs	71	28	77	30	f	34	85	42	92	48
Uniontown	66	26	79	24	81	30	84	41	90	41
Valley Head	63	15	68	7	80	20	81	32	90	34
Wiggins	....	....	....	....	83	32	90	37	96	42
Alaska:										
Killisnoo	52	21	45	11	52	24	55	26	61	33
Arizona:										
Bangharts	....	....	....	....	....	....	....	....	....	....
Benson	65	30	69	24	80	42	92	50	98	57
Casa Grande	71	35	72	40	89	53	99	54	104	62
Eagle Pass (Curtis)	58	19	66	20	....	....	....	....	....	52
Flagstaff	....	....	....	....	....	....	....	25	95	19
Florence	67	26	73	25	84	41	99	44	102	45
Fort Apache (1)	60	7	63	6	74	24	87	30	93	30
Fort Apache (2)	j57	6	60	5	79	25	86	32	92	30
Fort Bowie (1)	56	19	60	21	75	35	86	40	91	44
Fort Bowie (2)	....	....	60	14	75	30	86	40	92	44
Fort Grant	61	20	65	22	76	34	86	38	91	42

APPENDIX 12—Continued.

PERATURES FOR 1889, COMPILED FROM REPORTS OF REGULAR SIGNAL SERVICE
STATES POST SURGEONS, OBSERVERS OF THE NEW ENGLAND METEOROLOGICAL

the record; thus "c" indicates that three days are missing.]

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
92	46	98	68	92	63	93	48	82	38	76	24	74	29	80
92	[illegible]26	94	70	90	63	92	48	84	36	76	22	78	25	74
95	43	93	68	93	62	92	44	....	....	82	24	77	26	....
100	46	99	68	96	55	i100	i49	....	....	....	....	82	29	....
93	h60	96	65	92	58	94	42	85	33	75	20	75	23	....
94	38	98	64	92	56	94	42	82	32	76	22	....	....	....
96	48	94	66	90	62	90	42	79	31	72	27	75	36	....
94	46	96	68	94	62	96	46	84	40	80	30	....	....	....
97	44	99	68	96	61	95	45	88	33	76	22	....	....	....
90	39	91	63	91	62	91	44	81	33	78	20	76	22	....
86	45	....	....	....	....	....	....	....	....	....	....	....	....	....
96	45	98	69	95	61	95	47	85	38	76	27	....	....	....
....	....	....	....	....	....	....	....	82	32	78	23	77	24	....
94	46	93	72	92	65	96	52	86	40	76	26	76	30	76
92	45	94	68	89	f72	h92	h47	86	35	76	22	77	26	74
94	42	94	66	92	58	94	44	88	32	76	20	....	....	....
94	38	94	62	94	56	92	44	86	32	76	20	....	....	....
92	50	95	70	96	66	93	53	85	43	77	30	77	32	67
94	48	99	66	94	63	95	50	87	39	77	27	79	29	78
92	41	92	62	90	61	91	45	....	....	....	....	....	....	....
97	48	100	65	96	61	h98	47	92	38	80	23	81	28	78
....	....	94	70	....	....	92	48	84	39	....	....	....	....	....
86	38	88	59	....	....	....	....	....	....	....	....	....	....	....
96	44	100	66	96	62	....	....	....	....	78	40	....	....	....
98	40	100	66	94	56	92	40	90	32	76	26	....	....	....
96	43	98	67	95	62	d96	d47	88	36	80	26	....	....	....
93	42	100	67	....	....	....	....	....	....	....	....	....	....	....
89	43	91	66	90	62	92	44	....	....	....	....	....	....	....
89	50	92	68	92	56	90	47	83	37	78	25	74	24	77
90	36	94	58	90	61	92	40	86	28	80	20	....	....	....
96	66	98	70	....	....	95	48	87	38	75	21	....	....	....
95	44	94	67	92	64	94	48	87	39	75	24	76	28	71
88	36	95	62	90	51	89	36	90	27	72	22	76	20	88
101	48	e102	e62	h97	h60	99	55	88	36	....	....	82	28	....
74	38	72	45	70	40	63	13	....	....	51	24	41	13	....
....	....	110	....	104	....	....	....	....	....	81	20	81	26	....
100	74	102	75	101	74	95	54	90	52	76	31	72	29	78
112	70	116	78	114	79	109	68	109	53	94	48	90	40	81
....	....	....	69	....	64	....	....	....	....	....	25	....	28	....
100	30	102	40	89	46	85	31	79	21	57	9	59	—5	....
109	57	111	66	110	70	99	51	99	35	84	32	75	31	86
99	44	101	54	95	55	90	52	88	27	76	16	72	17	95
98	42	102	55	96	52	90	32	87	21	69	16	66	17	97
94	56	101	62	95	63	90	36	81	39	70	25	67	24	82
94	56	101	62	97	62	92	32	81	46	70	27	74	25	87
98	51	100	58	97	62	93	40	88	39	72	26	71	27	80

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Arizona—Continued.	°	°	°	°	°	°	°	°	°	°
Fort Huachuca	54	23	69	21	80	32	90	37	90	44
Fort Lowell	72	25		22	86	35	100	36	105	37
Fort McDowell (1)	67	26	78	26	85	38	101	39	107	63
Fort McDowell (2)	72	25	80	26	87	37	103	39	110	45
Fort Mojave	68	30	74	28	88	43	103	34	108	50
Fort Thomas	65	22	68	21	80	33	96	34	100	39
Fort Verde (1)	62	15	70	14	80	29	94	34	100	40
Fort Verde (2)	62	15	71	14	80	29	94	34	100	34
Gila Bend										
Globe	62	20	69		81		94		98	
Holbrook	53	7	61	10	75	26	89	29	94	29
Huachuca, Mount	56	19	70	22	80	34	88	42		
Lochiel										
Maricopa	80	30	70	40	82	52	97	58	105	60
Pantano	58	27	62	29	81	39	98	42	99	55
Peoria	65	30	71	27	85	40	101	44	107	45
Phœnix									108	48
San Carlos Agency	64	23	68	24	84	34	99	38	104	44
San Carlos										
San Simon	70	30	75	25	76	34	102	40	106	40
Signal										
Texas Hill	61	30	75	39	88	55	106	63	100	60
Tombstone							86	45	93	36
Tucson (1)	77	30	82	29	81	44	[j]95	[g]43	[h]96	[h]48
Tucson (2)	70	38	69	39	80	44	97	45	99	49
Volunteer Springs							82	22	[f]87	17
Whipple Barracks	54	— 8	59	— 4	69	25	82	30	86	29
Wilcox (1)	68	18	72	16	82	25	95	25	99	32
Wilcox (2)	65	25	72	29	82	34	95	41	98	54
Williams	50	0	48	20	62	18	76	21	83	23
Winslow					71	21	86	21		
Yuma (1)	72	35	78	34	90	44	104	46	107	50
Yuma (2)	70	41	73	41	79	55				
Arkansas:										
Alexander	61	18	75	14	79	24	82	44	87	48
Camden			71	23	78	31	85	45		
Conway	64	21	74	19	80	30	83	47	87	46
Dayton	63	15	66	25	78	30	82	48	86	43
Dallas	50	27	69	31	67	39	81	40	85	38
Devall's Bluff									90	37
El Dorado	66	19	72	18	76	28			86	42
Eureka Springs	66	5	76	4						
Fort Smith	65	13	72	16	83	26	87	43	90	40
Forrest City	66	19	78	19	83	30	87	44	89	42
Heber	65	15	74	12	75	25	85	40	88	37
Helena	64	21	77	15	79	27	85	42	93	40
Hot Springs		15	78	14	80	26	85	40	90	37
Lead Hill	65	11	72	10	84	22	90	36	96	36
Little Rock	66	20	78	17	79	31	82	46	88	44
Little Rock Barracks	66	20	78	17	79	23	86	38	88	50
Lonoke	67	24	76	19	78	30	81	48	85	45
Malvern										
Monticello									[g]91	
Newport							83	36	89	43
Osceola					77	28	84	38	90	41
Ozone	59	9	63	11	72	26	78	43	84	41
Pine Bluff										
Prescott									[d]87	[d]45

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
95	51	96	55	95	51	92	39	84	40	75	23	69	27	75
108	52	111	63	108	66	101	45	101	35	92	26	87	29	89
112	50	116	67	115	72	109	52	106	38	84	32	77	31	90
113	54	117	67	117	71	108	51	106	38	84	31	77	32	92
113	64	120	72	116	67	113	55	107	40	75	32	72	32	92
104	52	109	62	106	64	102	44	93	33	72	15	71	24	94
104	52	110	61	106	63	98	43	96	34	73	23	65	26	96
104	50	110	57	106	62	99	38	97	30	73	20	65	26	96
.....	.....	112	84	111	78	104	64	104	54	74	42	76	42	....
99	.....	102	.....	102	65	100	46	89	36	70	15	.....	.....	....
99	42	100	58	99	59	92	37	89	28	.....	.....	68	18	....
.....	.....	.....	.....	109	62	93	43	89	40	77	25	77	25	....
.....	.....	[g]100	[g]68	94	67	88	46	83	43	73	26	71	26	....
106	75	115	80	115	70	98	65	.....	.....	80	42	73	37	85
102	70	111	70	105	71	93	54	91	55	80	37	75	35	84
.....	.....	.....	.....	112	54	108	50	100	41	78	34	69	33	....
109	62	112	72	113	76	101	59	99	47	76	40	68	38	....
108	54	111	65	109	57	104	42	95	36	70	26	68	28	88
[m]110	[m]54	111	64	111	65	107	46	98	34	81	27	72	26	....
102	60	110	70	110	70	105	51	.....	.....	.....	.....	.....	.....	....
107	60	114	68	112	73	103	55	101	40	77	32	67	31	....
113	72	121	85	119	86	112	71	110	60	82	37	74	45	91
98	54	99	63	98	63	.....	.....	.....	.....	74	28	.....	.....	....
[f]102	.....	.....	.....	[g]104	.....	100	[f]53	95	42	82	32	76	21	....
102	50	.....	.....	106	85	.....	.....	92	59	75	43	75	34	....
92	28	.....	.....	99	40	.....	.....	.....	.....	.....	.....	.....	.....	....
91	40	100	54	94	55	87	37	87	28	70	20	58	18	108
105	47	106	56	104	51	98	37	89	30	77	15	72	20	91
98	65	.....	.....	103	65	100	50	98	39	79	30	78	34	....
91	32	96	45	89	40	81	30	82	20	54	12	52	30	96
101	54	101	50	97	52	92	46	86	34	72	16	68	8	....
109	63	117	67	114	73	106	58	106	47	83	36	73	38	83
105	76	108	84	108	86	102	70	98	61	76	45	70	45	....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....
.....	.....	94	67	92	61	88	53	84	35	75	25	78	29	....
89	57	94	65	92	61	91	47	86	35	71	26	78	23	75
89	56	96	63	95	62	.....	.....	.....	.....	70	32	.....	.....	....
90	50	.....	.....	89	70	.....	.....	.....	.....	68	20	.....	.....	....
96	48	98	58	96	54	94	40	86	20	86	20	78	20	....
87	47	91	62	89	58	87	48	82	34	71	21	74	26	....
95	50	98	53	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....
94	50	98	60	98	59	92	42	87	31	76	21	79	26	85
95	50	94	59	92	56	90	46	86	38	75	24	80	28	76
94	44	97	56	96	57	.....	.....	84	31	68	18	76	19	....
94	46	98	64	94	58	94	46	84	34	76	22	.....	.....	....
93	44	98	55	96	52	93	50	89	45	72	23	82	26	84
100	50	107	58	101	59	94	40	91	32	76	20	80	20	97
91	51	95	65	93	61	91	50	82	36	73	25	78	28	78
91	51	95	65	97	59	94	49	86	32	73	22	78	26	80
94	53	97	64	93	62	90	53	84	38	73	25	80	28	78
[e]95	[e]54	102	58	98	52	.....	.....	82	52	77	32	76	54	....
94	48	98	66	94	62	94	50	86	34	76	26	76	38	....
96	46	98	60	94	58	94	44	82	30	72	22	.....	.....	....
91	45	93	62	94	58	92	46	86	33	77	21	83	25	....
86	54	91	59	87	60	82	44	80	41	67	19	71	23	82
94	50	96	66	94	62	92	50	84	34	74	28	76	28	....
88	59	94	64	92	62	88	52	80	36	72	26	.....	.....	....

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Arkansas—Continued.	°	°	°	°	°	°	°	°	°	°
Russellville	....	....	75	17	81	24	85	41	90	38
Stuttgart	65	22	78	16	76	28	82	44	86	39
Texarkana	67	20	85	22	82	33	88	33	90	44
Washington	79	21	78	20	80	28	85	42	87	40
Winslow	....	....	....	....	....	....	....	....	....	....
British Columbia:										
New Westminster	47	24	54	25	65	31	71	35	78	45
California:										
Alcade	60	30	70	29	80	42	98	48	106	50
Alcatraz Island	61	42	70	38	75	45	70	49	77	49
Almaden	68	31	74	33	80	51	85	48	88	51
American Hill	....	....	....	....	....	....	....	....	....	....
Anaheim	74	34	80	36	80	44	94	54	94	50
Anderson	69	28	82	27	83	41	88	44	98	45
Angel Island	73	39	82	30	86	42	77	50	89	45
Antioch	65	30	67	30	78	38	87	43	97	37
Aptos	65	30	76	32	80	40	75	45	80	45
Athlone	69	28	80	26	83	45	95	47	105	52
Auburn	64	27	76	32	79	38	83	43	89	46
Bakersfield	62	30	78	28	85	48	95	54	103	54
Barstow	62	19	74	22	79	38	94	44	104	44
Beaumont	68	32	70	30	74	43	87	40	90	43
Benicia Barracks	71	31	77	28	77	38	77	42	89	44
Berendo	....	....	....	....	e80	e48	94	50	102	53
Berkeley	60	36	70	34	74	43	75	44	86	45
Bishop Creek	62	13	74	19	82	40	93	44	106	53
Boca	....	....	60	—12	56	18	78	30	89	30
Borden	61	30	60	30	85	45	96	48	101	50
Boulder Creek	65	25	77	24	78	34	87	41	90	45
Brentwood	69	29	79	26	80	38	87	52	95	52
Brighton	69	30	80	32	90	42	87	51	100	47
Byron	64	30	68	26	78	46	84	56	98	54
Cactus	92	42	89	39	101	51	104	54	108	56
Caliente	66	28	73	32	85	39	91	45	99	49
Calistoga	67	24	85	21	86	35	87	45	93	44
Campo	....	....	65	28	68	30	70	31	70	40
Castroville	63	32	74	32	77	41	71	42	83	47
Centreville	68	37	80	38	80	50	81	54	93	50
Chico	66	31	78	27	....	45	86	48	104	48
Cisco	45	16	55	3	55	20	68	28	77	27
Coles	60	11	66	17	78	29	83	35	96	36
Colfax	64	28	76	22	76	34	79	38	94	35
Colton	84	26	84	22	88	40	102	48	100	54
Corning	54	30	60	30	80	40	83	45	105	45
Davis	64	32	72	27	78	46	89	52	100	54
Delano	68	29	80	25	85	47	97	50	104	48
Delta	68	27	79	24	87	35	88	38	99	40
Downey	69	34	80	29	77	45	90	48	94	56
Dunnigan	66	27	70	29	76	44	80	51	89	54
Dunsmuir	70	22	72	30	80	38	94	39	79	38
Edgwood	50	7	58	11	70	30	75	32	87	38
El Dorado	65	28	74	27	80	41	86	46	97	47
Elmira	70	31	100	28	97	50	95	45	103	50
El Verano	70	28	78	28	83	42	82	48	85	48
Emigrant Gap	56	20	68	10	64	27	72	27	82	30
Esperanza	54	30	66	30	81	38	88	42	102	50
Eureka	71	29	68	28	66	39	68	40	69	44
Farmington	63	29	71	28	89	45	91	51	100	50

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		Range.
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
94	52	97	60	96	59	93	48	86	32	73	24	....	....	....
93	49	95	60	93	57	92	44	81	30	72	21	76	24	79
94	50	100	68	98	60	94	52	90	32	78	28	80	40	80
89	47	98	67	94	58	90	49	87	33	74	22	79	30	78
....	....	89	57	87	55	83	36	80	40	69	17	70	19	....
84	46	90	50	84	48	79	40	71	39	60	31	46	20	70
105	65	114	65	110	65	106	60	85	45	70	40	65	40	85
69	50	65	48	67	50	88	51	84	51	74	48	62	41	50
90	58	93	58	95	57	97	52	87	47	69	42	61	35	66
93	52	100	58	100	60	98	48	92	41	70	38	71	26	....
86	60	104	58	100	63	102	60	88	52	84	45	76	42	70
104	60	110	62	110	60	103	47	96	37	81	31	65	27	83
87	51	81	48	84	48	95	50	93	46	82	43	65	33	65
91	53	104	59	....	....	....	....	88	48	80	40	64	37	....
85	55	80	52	85	50	86	48	85	45	75	38	65	35	56
93	55	114	60	114	60	108	55	101	43	80	39	70	35	88
106	61	105	56	101	59	98	46	95	45	80	40	58	37	79
106	71	112	67	111	56	98	63	90	52	75	41	69	35	84
105	56	112	60	109	57	104	46	97	35	75	27	64	27	93
97	55	113	70	102	69	98	60	80	49	72	47	60	35	83
90	51	99	50	97	51	100	51	88	45	79	40	62	32	72
106	68	113	66	110	60	106	61	98	46	76	40	66	32	....
78	51	85	52	79	51	87	48	82	47	74	43	60	36	53
105	70	114	79	109	73	102	55	....	....	....	....	59	20	....
95	36	103	40	109	33	....	....	69	22	74	10	48	—20	....
109	60	114	60	111	60	105	46	99	38	80	36	66	38	84
90	50	96	45	100	42	100	39	90	39	78	28	78	28	76
94	65	105	67	102	62	100	58	92	45	77	36	70	35	79
100	58	104	55	106	59	106	50	98	45	80	40	63	39	76
96	64	108	66	102	66	102	58	90	48	74	36	62	32	82
115	68	122	83	122	78	110	72	115	58	90	54	80	49	83
105	64	112	70	106	70	90	60	91	43	68	47	62	40	84
98	50	104	48	102	50	97	38	90	40	90	29	68	28	83
95	44	100	52	103	60	95	58	85	40	65	48	65	43	....
71	54	69	53	73	52	84	46	85	45	72	40	65	35	53
93	58	100	58	96	58	104	56	95	52	80	46	66	38	67
106	60	114	65	115	65	103	53	98	50	75	40	60	32	88
77	44	88	49	85	45	82	39	76	32	57	28	40	20	85
98	45	....	....	....	....	....	....	....	....	....	....	....	....	....
94	56	102	60	100	59	97	54	92	40	70	38	62	30	80
102	60	114	60	111	60	102	58	102	48	82	40	74	32	92
108	47	111	64	106	56	109	54	98	47	80	36	70	32	81
99	58	105	52	107	56	107	54	95	49	77	38	65	36	80
105	63	112	67	108	68	106	64	101	48	72	42	67	33	87
102	58	109	55	103	54	102	44	91	40	75	37	56	32	85
84	60	95	60	93	59	96	56	84	50	82	45	70	38	67
91	63	105	60	96	58	99	60	85	50	69	45	62	37	78
106	45	110	48	101	48	98	42	76	38	65	35	53	26	88
94	51	100	49	92	40	85	36	70	37	55	23	....	....	....
98	59	106	61	104	62	101	50	96	42	73	40	57	34	79
100	60	110	58	110	58	105	54	100	46	80	40	65	30	82
87	52	100	52	96	50	102	45	86	44	78	32	64	32	74
84	44	90	49	88	51	87	44	78	32	60	30	44	22	80
102	60	108	52	105	55	108	52	88	48	68	40	60	32	78
66	45	67	46	69	47	77	40	71	41	73	38	60	34	49
101	62	110	56	107	59	105	53	99	43	74	36	70	35	82

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
California—Continued.	°	°	°	°	°	°	°	°	°	°
Felton	71	24	80	24	85	32	85	40	84	40
Florence	84	34	86	40	80	48	90	51	88	50
Folsom City	64	27	76	32	80	46	88	53	98	50
Fort Bidwell	45	−2	60	10	74	23	80	22	90	30
Fort Gaston	54	19	67	13	74	26	85	21	99	33
Fort Mason	61	39	67	37	74	45	72	46	84	47
Fresno (1)	63	28	75	27	84	38	93	41	101	44
Fresno (2)	69	29	.....	30	95	43	94	50	106	50
Fruto	71	32	80	28	78	40	87	42	103	46
Galt	57	28	68	29	79	43	84	46	82	50
Georgetown	62	25	.....	24	.....	32	[b]78	34	86	36
Gilroy	65	28	82	28	80	38	85	45	95	50
Girard	67	26	75	26	71	38	89	40	91	38
Glen Ellen	70	27	78	24	81	38	85	45	91	47
Goshen	62	29	74	23	86	35	92	50	102	50
Hanford	64	30	71	27	83	40	[d]90	[d]50	.....	.....
Hollister	77	29	78	29	86	38	85	52	88	53
Hornbrook	55	2	70	19	75	27	90	29	102	38
Hydesville	66	27	66	26	74	32	.....	.....	81	40
Indio	78	30	87	32	98	47	105	54	105	62
Ione	72	24	68	28	80	38	90	45	100	50
Iowa City	.....	.....	.....	.....	.....	.....	.....	.....	90	40
Julian	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Keeler (1)	59	23	72	21	75	36	86	40	96	36
Keeler (2)	54	27	71	24	73	39	84	46	95	45
Keene	66	25	72	20	72	38	84	35	91	42
King City	70	25	80	25	82	33	82	38	104	42
Kingsburgh	60	30	72	32	84	45	94	52	100	55
Knight's Landing	57	32	75	35	78	37	95	44	93	40
La Grange	62	30	70	32	80	41	94	41	104	46
Lathrop	68	30	78	30	87	40	87	40	98	35
Laurel	65	30	78	28	79	40	86	47	90	49
Lemoore	59	39	84	38	81	42	96	50	102	51
Lewis Creek	60	33	73	24	82	44	92	48	100	48
Livermore	74	30	81	30	83	39	85	47	94	48
Livingston	62	32	71	29	81	45	90	47	104	50
Long Beach	76	31	85	29	88	37	86	49	80	53
Los Angeles (1)	71	32	84	33	81	44	93	46	94	46
Los Angeles (2)	68	28	84	35	76	46	91	50	92	52
Los Banos	62	28	71	32	81	45	92	52	101	50
Los Gatos	62	29	75	29	84	44	85	46	95	53
Mammoth Tank	75	30	80	30	91	50	106	54	110	56
Martinez	69	29	71	32	72	36	76	44	87	50
Marysville	75	34	80	36	82	48	85	55	92	52
Menlo Park	64	32	69	32	81	40	81	46	86	48
Merced	68	32	72	26	86	42	92	46	101	50
Modesto	68	32	72	28	80	45	86	48	101	50
Mojave	91	26	96	28	90	38	99	40	99	43
Montague	54	0	66	20	71	35	84	41	98	40
Monterey	70	29	70	28	68	42	70	51	81	54
Monterey (Hotel del Monte)	.....	.....	73	32	79	45	70	52	68	[f]50
Mount Hamilton	60	26	70	22	64	31	74	30	82	32
Napa City	59	28	74	32	80	37	90	44	88	47
National City (Sweetwater Dam)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Needles	67	32	75	31	.....	.....	.....	.....	.....	.....
Newark	64	32	64	32	80	42	80	50	88	52

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
95	35	98	45	98	40	102	36	90	38	76	28	68	30	78
82	58	95	60	93	58	98	57	83	50	89	43	80	39	64
100	62	109	62	104	58	103	56	95	47	75	42	65	35	82
93	43	99	44	95	38	90	32	84	28	60	20	49	4	101
101	36	110	40	98	36	95	29	85	33	68	22	56	29	97
76	50	69	49	75	48	85	47	.....	.....	73	46	62	38	....
106	55	112	55	110	54	105	50	98	42	72	36	65	31	85
106	62	115	65	112	65	110	58	106	50	90	40	66	40	86
106	60	113	66	109	66	106	63	90	45	76	39	64	31	85
96	62	106	62	104	60	94	58	80	45	65	38	62	39	78
89	48	99	56	97	54	94	44	90	39	70	34	52	29	75
92	50	97	55	100	52	102	48	89	42	76	32	65	32	74
95	58	102	67	100	60	95	48	95	45	65	30	58	28	76
93	48	103	52	101	49	100	42	92	42	78	31	65	28	79
107	71	110	63	108	62	104	56	100	47	73	36	64	31	87
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....
78	50	97	56	101	52	101	48	97	40	82	34	73	35	72
106	57	107	60	102	45	98	38	90	40	65	25	50	17	105
75	40	87	42	76	42	86	33	76	40	73	30	59	29	....
108	70	114	82	116	80	112	65	118	50	80	40	75	40	86
98	54	104	54	102	58	100	45	94	40	74	31	62	32	80
93	56	100	67	99	62	95	54	92	43	72	37	55	29	....
.....	.....	101	65	100	61	91	52	93	45	78	35	63	35	....
97	63	107	65	101	64	97	50	91	41	71	33	62	23	86
95	65	107	69	100	68	95	53	91	43	68	38	67	30	83
96	60	104	65	103	57	98	55	94	42	75	38	60	30	84
105	40	97	40	105	48	102	38	90	38	78	31	66	30	80
105	69	112	70	100	65	104	54	90	45	78	38	68	33	82
95	50	104	47	96	60	98	50	82	46	78	42	62	36	72
106	56	110	54	114	50	105	47	92	42	74	38	63	37	84
100	44	106	48	106	38	104	50	93	45	75	36	60	36	76
91	53	98	55	101	50	99	59	94	42	75	39	65	32	73
105	64	111	63	106	62	99	57	97	53	87	34	78	30	81
104	64	110	64	109	65	104	57	93	50	68	44	64	33	86
92	50	98	52	98	50	98	48	94	43	80	38	62	29	69
102	58	110	60	109	60	108	52	95	44	80	40	67	41	81
82	62	96	64	97	63	96	59	80	50	.....	.....	.....	.....	....
81	51	99	54	95	53	103	52	89	50	82	43	68	40	71
90	58	100	58	104	60	100	57	85	48	80	44	70	39	76
100	62	110	62	111	63	.....	.....	96	45	76	40	62	35	....
92	58	99	56	97	55	100	49	91	43	75	38	64	32	71
110	67	120	84	119	81	108	73	108	55	81	38	72	28	92
.....	.....	94	54	86	56	100	48	80	46	70	40	62	32	....
100	60	105	60	96	60	99	60	99	48	75	48	65	35	71
85	54	96	54	88	50	96	48	88	44	75	38	62	34	64
100	56	108	58	108	58	106	52	95	42	70	40	62	40	82
97	56	106	60	105	65	103	55	92	51	74	41	66	38	78
100	62	111	70	108	67	116	60	116	48	96	38	77	30	90
102	64	104	70	100	74	99	48	76	50	64	36	52	28	104
78	59	79	59	77	57	88	50	78	44	68	32	62	32	60
98	54	78	60	78	50	83	48	85	50	75	44	64	35	....
84	46	92	50	92	51	88	47	85	34	63	30	46	29	70
97	56	98	53	90	50	97	50	81	45	69	39	65	32	70
.....	.....	92	59	96	60	95	52	83	47	84	40	68	34	....
.....	.....	119	77	117	70	.....	.....	100	44	81	37	75	29	....
86	55	90	57	88	56	96	50	88	46	76	40	60	30	66

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
California—Continued.	°	°	°	°	°	°	°	°	°	°
Newhall	70	26	.....	.....	84	38	93	38	94	49
Newman	65	30	65	30	87	40	90	40	100	46
Niles	70	33	75	32	78	40	83	53	92	54
Norwalk	70	28	80	28	80	49	95	55	95	57
Oakland (1)	62	34	64	35	74	44	74	48	87	52
Oakland (2)	64	34	64	35	76	44	70	50	78	50
Ontario	.....	.....	84	32	84	41	98	50	86	62
Orland	70	34	80	28	87	47	90	52	102	50
Oroville	71	32	76	35	77	42	82	45	92	49
Pajaro	71	30	84	28	80	40	84	41	83	48
Paso Robles	67	22	69	22	76	32	88	43	94	45
Petaluma	66	30	74	25	78	39	81	47	87	51
Placerville	59	26	72	25	78	40	83	42	94	46
Pleasanton	76	24	77	26	85	38	88	48	88	42
Point Reyes Light	.....	.....	.....	.....	73	43	71	41	82	41
Pomona	80	35	80	34	79	53	88	56	94	59
Portersville	61	30	77	27	82	44	96	49	109	53
Puente	70	28	81	28	80	44	93	52	95	54
Red Bluff (1)	68	30	80	26	82	42	87	40	103	42
Red Bluff (2)	80	31	90	32	84	46	86	48	100	50
Redding	65	30	77	30	86	43	88	43	104	46
Riverside	70	30	80	27	85	38	98	43	102	43
Rocklin	62	29	76	30	82	40	88	44	102	52
Rumsey	65	30	68	30	70	44	85	34	100	50
Sacramento (1)	62	31	76	31	76	41	84	42	94	44
Sacramento (2)	60	24	73	23	78	34	82	36	90	38
Sacramento (3)	58	31	70	32	72	46	80	52	87	52
Salinas (1)	64	28	76	30	k 77	k 43	76	48	87	49
Salinas (2)	61	28	76	30	71	40	72	50	76	48
Salton	85	40	90	49	93	50	109	50	108	58
San Ardo	60	28	72	28	85	40	90	50	99	48
San Bernardino	76	33	82	34	82	46	90	49	90	46
San Diego	78	36	85	37	80	45	83	47	80	50
San Diego Barracks	71	36	81	37	81	47	86	48	82	49
San Francisco	64	40	75	39	79	47	77	49	88	48
San Francisco (Presidio of)	66	36	70	31	79	41	70	43	84	44
San Fernando	66	30	78	32	80	38	94	46	98	46
San Gabriel	72	30	80	30	85	46	95	50	98	54
Sanger Junction	63	26	76	25	85	45	98	49	105	54
San José	62	32	71	32	78	41	80	47	89	51
San Luis Obispo	68	35	84	37	79	44	93	43	90	44
San Mateo	62	32	70	32	76	40	76	50	84	50
San Miguel	63	26	75	23	80	34	88	49	93	45
San Pedro	66	40	78	45	82	53	84	54	83	54
Santa Ana	74	34	85	32	81	50	92	54	96	58
Santa Barbara (1)	68	38	80	35	81	44	88	44	83	47
Santa Barbara (2)	70	36	80	34	78	48	86	52	86	54
Santa Clara	68	30	78	32	79	41	81	44	89	44
Santa Cruz	70	34	73	35	78	41	80	48	72	50
Santa Margarita	.....	.....	72	19	73	30	88	42	86	47
Santa Maria	70	28	83	28	83	30	88	37	88	40
Santa Monica	67	36	80	40	72	43	72	52	86	56
Santa Paula	78	38	80	38	85	48	90	50	88	54
Santa Rosa	69	28	72	25	79	35	81	43	83	42
Selma	60	29	76	30	80	42	92	46	98	52
Seven Palms	81	37	82	37	95	50	109	57	110	64
Shingle Springs	.....	.....	.....	.....	79	40	70	44	94	40

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
95	50	112	55	110	55	102	54	....	....	82	33	66	26	....
104	60	110	60	107	60	106	52	90	48	70	40	60	35	80
87	56	95	55	92	49	96	45	87	45	81	40	79	32	64
87	60	99	60	99	60	97	56	86	54	84	40	68	33	71
78	55	84	53	79	51	93	49	87	45	80	39	67	34	59
78	54	70	50	74	54	90	50	76	48	70	38	66	36	56
85	60	102	69	102	70	100	70	87	60	....	....	66	32	....
105	58	112	65	105	62	105	56	95	47	85	42	58	35	84
96	60	102	56	99	58	96	42	90	44	77	39	61	33	70
72	56	75	56	81	55	88	56	94	40	75	35	66	32	66
100	52	104	50	101	47	101	42	95	39	....	....	62	29	....
89	52	97	52	94	51	99	42	90	45	76	36	61	33	74
95	60	103	61	102	55	99	50	95	40	71	36	58	32	78
88	58	100	61	100	59	98	52	82	48	....	....	62	31	....
68	47	70	48	70	47	....	47	64	47	72	45	59	39	....
92	63	102	66	96	64	92	62	90	55	81	44	76	44	68
110	70	116	68	110	74	110	62	107	50	79	38	78	33	89
92	60	104	60	103	61	102	57	94	49	80	39	67	33	76
105	55	111	54	106	57	105	52	92	44	76	36	57	31	85
105	59	110	62	105	62	105	57	98	48	75	42	65	37	79
108	55	115	62	105	62	104	53	86	41	79	36	57	30	85
99	49	107	54	100	53	98	48	93	43	76	36	63	32	80
104	58	113	57	108	59	105	56	95	45	77	42	63	35	84
112	60	110	60	105	68	104	62	88	49	73	40	62	35	82
96	52	104	50	102	51	101	49	94	42	72	38	60	33	73
90	47	96	48	92	45	92	41	83	36	68	30	60	27	73
89	56	95	60	94	60	90	53	86	47	69	42	60	37	64
[d] 75	[d] 51	78	53	76	52	88	48	94	44	78	[f] 38	[h] 65	[h] 35	66
71	54	67	56	73	52	82	47	[g] 68	42	67	38	63	39	54
113	74	119	78	117	74	109	60	109	50	84	34	77	30	89
98	54	104	52	106	52	104	45	99	41	78	37	64	34	78
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
72	56	84	59	89	62	91	54	80	52	83	46	69	40	55
74	57	85	59	89	63	92	58	80	52	83	45	69	37	56
75	52	83	50	80	49	89	51	87	51	77	47	63	40	50
68	47	80	47	77	47	90	46	87	48	78	42	64	33	59
96	48	113	53	108	52	102	50	91	42	78	47	70	32	83
90	60	106	60	100	60	98	58	88	54	83	44	71	33	76
109	63	116	67	110	67	112	54	102	44	76	40	72	36	91
85	56	93	55	89	52	95	50	86	46	75	38	62	34	63
92	49	93	47	....	....	....	....	....	....	....	....	....	....	....
79	55	88	50	82	50	90	45	84	46	71	38	64	34	58
96	55	104	50	104	54	102	48	97	44	73	35	68	33	81
87	61	96	64	89	63	102	60	82	57	....	....	68	42	....
88	60	98	62	100	60	100	60	88	54	84	40	70	38	68
74	50	107	53	91	53	100	51	85	50	78	44	68	40	72
76	60	88	60	88	60	98	60	78	52	76	42	76	38	64
85	52	94	49	88	47	96	43	84	44	78	30	63	33	66
87	55	89	52	86	52	93	50	90	47	....	....	70	36	....
95	50	106	52	99	50	100	42	92	37	70	29	61	29	....
86	50	86	44	92	47	100	42	88	42	78	34	68	32	72
82	60	83	62	89	63	91	64	83	54	72	46	72	38	55
82	58	100	58	92	55	105	58	88	54	81	45	70	38	67
88	52	90	46	86	45	90	42	82	44	76	34	66	32	65
....	....	110	67	110	68	102	58	98	45	70	38	63	32	....
111	75	120	82	120	75	115	70	110	60	86	47	83	40	83
98	57	104	59	103	64	99	55	90	45	70	38	65	34	....

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
California—Continued.	°	°	°	°	°	°	°	°	°	°
Sims	65	20	70	30	75	30	90	29	99	40
Sisson	54	11	63	13	76	30	76	32	86	30
Soledad	66	26	80	26	80	40	84	40	98	48
Soquel	70	30	76	30	68	42	76	48	95	50
South Side	70	32	70	26	72	34	92	40	88	46
South Vallejo	68	31	68	32	77	40	73	46	82	48
Spadra	71	32	84	31	84	42	94	48	98	50
Steele's	68	33	79	34	78	42	88	41	89	43
Stockton	56	34	64	34	70	43	79	50	90	44
Suisun	62	34	80	32	82	45	90	48	92	50
Summit	40	8	45	— 1	47	18	60	22	73	25
Susanville	48	7	58	7	70	27	78	35	90	36
Tehachapi	50	20	65	18	60	30	78	37	85	30
Tehama	72	34	70	36	80	45	81	50	104	50
Templeton	66	24	73	23	83	35	89	48	94	48
Towles	62	22	72	12	72	34	78	38	90	36
Tracy	50	30	60	29	75	40	82	47	102	52
Traver	55	24	69	24	95	38	88	42	96	50
Tropico	70	30	83	26	77	40	94	43	92	51
Truckee	46	— 6	54	— 8	70	12	76	30	86	32
Tulare	65	30	77	30	86	46	96	50	104	50
Turlock	62	32	74	30	81	44	92	49	99	50
Upper Mattole	69	27	85	22	90	33	82	40	90	42
Vacaville (1)	66	31	74	32	78	43	84	50	99	50
Vacaville (2)	62	32	76	29	78	42	84	48	97	50
Valley Springs	61	30	71	30	80	40	87	52	97	50
Vina	65	30	75	29	80	43	90	46	93	42
Volcano Springs	78	30	86	35	98	45	110	60	117	38
Walla Walla Creek	49	10	58	12	74	24	78	30	89	30
Walnut Creek	92	28	92	24	83	37	83	43	93	45
Westley	65	31	72	32	80	45	89	47	98	53
Wheatland	63	29	75	29	76	40	83	42	95	45
Whittier	70	39	86	40	95	42	96	50	103	52
Williams	58	34	64	30	68	44	70	52	100	48
Willow (1)	58	27	71	21	78	36	87	38	102	40
Willow (2)	54	31	62	30	65	40	80	44	98	48
Winters	69	34	77	30	82	45	100	49	108	49
Woodland	60	29	70	30	70	40	74	50	90	48
Colorado:										
Alma	39	—10	42	—16	52	3	60	— 1	66	0
Bennet	....	....	60	—10	84	19	90	24	....	29
Breckenridge	70	—20	61	—23	61	— 3	72	— 5	75	5
Cañon City	....	....	67	1	71	18	82	26	86	34
Colorado Springs	55	— 4	56	— 8	68	18	76	26	79	31
Como (Ranch near)	42	— 8	....	....	54	8	60	10	....	....
Coulter	50	—22	50	—10	59	7	69	14	71	26
Delta	50	0	56	7	[d]72	[e]31	92	26	[n]97	44
Denver (1)	56	4	61	— 7	70	18	78	29	83	32
Denver (2)	....	....	61	— 6	68	21	79	24	88	24
Dolly Varden Mine	....	....	....	....	33?	0	41	4	50	10
Fort Collins	58	— 4	62	—16	68	17	79	28	81	31
Fort Crawford	45	—10	54	— 7	68	22	81	22	84	31
Fort Lewis	45	—12	55	—18	63	8	77	26	77	22
Fort Logan	60	2	62	—10	72	18	83	29	86	27
Fort Lyon	56	—16	62	— 8	77	13	89	25	94	33
Fraser	....	....	....	....	....	....	78	12	74	28
Georgetown	44	2	46	— 2	56	18	64	22	71	22
Glenwood Springs	46	— 8	53	— 9	71	22	86	23	91	32

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
109	55	103	45	100	48	99	40	89	35	70	28	55	22	89
89	50	94	60	98	50	85	43	78	29	59	26	49	17	87
84	50	86	50	94	46	98	42	88	40	....	....	64	30	....
82	60	86	50	88	52	92	46	90	42	78	40	70	38	65
99	50	106	52	106	56	104	50	96	52	70	38	64	34	80
75	50	80	50	75	51	83	50	83	45	68	34	60	34	52
92	56	100	59	109	58	105	53	98	48	82	44	71	36	78
79	48	88	44	92	48	99	44	91	45	73	38	61	36	66
92	60	98	55	96	58	98	54	80	55	76	52	72	40	64
95	58	102	55	103	58	102	52	98	42	81	32	62	36	71
76	38	84	43	98	40	78	40	72	27	52	23	36	12	99
84	51	110	52	95	49	89	37	80	28	57	22	52	2	103
94	54	100	70	90	62	90	52	84	36	75	30	55	25	82
102	65	115	72	102	65	100	60	72	48	75	44	58	40	81
98	55	108	50	105	49	105	43	95	41	75	32	62	32	85
90	54	98	65	94	65	90	56	87	40	75	32	47	28	86
103	62	108	59	108	62	106	62	99	49	69	32	59	32	79
102	68	111	66	101	69	102	60	98	50	75	38	70	37	87
88	57	103	57	100	53	102	51	88	47	80	41	68	38	77
90	46	98	46	90	42	88	36	80	24	56	18	40	—12	110
105	64	113	67	110	65	106	57	102	50	76	42	70	39	83
103	63	106	64	107	62	103	54	87	45	76	40	65	37	77
89	50	95	46	93	40	101	38	82	40	78	28	72	30	79
98	58	105	58	103	56	103	54	95	48	75	41	62	33	74
95	60	107	60	104	57	98	55	88	50	70	43	61	30	78
99	59	101	65	101	65	97	55	91	48	65	47	60	39	71
107	60	114	59	103	59	102	50	84	46	....	....	57	32	....
120	70	126	80	126	78	114	60	113	56	87	38	86	35	96
94	39	98	43	92	40	92	36	83	33	61	27	53	12	88
98	50	109	50	102	46	102	50	95	43	74	35	62	33	85
99	63	105	68	105	60	104	52	92	50	74	42	65	37	74
98	52	106	47	102	53	101	49	93	41	73	37	59	31	77
91	59	104	61	101	63	109	60	90	50	84	49	80	39	70
106	60	115	66	112	64	....	....	76	49	....	....	48?	30	....
105	53	112	50	109	52	103	47	92	42	75	33	60	29	91
104	47	109	58	109	61	102	50	93	47	68	38	62	32	79
103	67	110	67	105	61	105	56	98	50	77	40	69	32	80
98	56	100	54	95	42	94	54	84	45	78	40	62	35	71
72	23	78	29	76	34	75	8	68	8	....	....	....	....	....
112	45	....	....	....	....	....	....	....	....	62	5	71	6	....
85	8	88	25	87	25	84	8	88	7	80	—16	86	—17	111
94	42	102	52	102	50	94	32	91	29	70	5	69	11	....
91	36	96	45	94	47	90	28	81	23	62	6	68	5	104
....	....	82	37	81	37	....	....	....	....	48	— 4	43	— 8	....
81	28	87	43	88	36	81	15	....	....	....	....	....	....	....
....	54	[g]105	58	105	59	96	39	85	31	61	11	56	12	....
92	37	100	50	98	46	94	30	85	25	60	3	66	4	107
95	37	....	....	....	....	....	....	81	20	57	0	....	....	....
58	10	63	30	62	28	60	5	54	0	....	....	....	....	....
90	35	97	38	97	41	93	23	85	25	61	1	66	3	113
99	33	....	....	95	45	89	26	85	25	58	9	59	0	....
82	30	88	45	87	38	82	21	77	19	55	5	52	— 5	106
96	43	101	50	100	44	96	28	89	23	55	1	70	1	111
102	39	109	43	106	47	101	18	93	17	....	....	....	....	....
74	34	81	45	[d]79	[d]42	....	....	....	1	....	—22	....	—24	....
78	24	84	42	81	46	77	27	70	20	52	7	53	7	86
98	34	102	46	102	41	....	....	89	27	56	2	54	6	....

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Colorado—Continued.	°	°	°	°	°	°	°	°	°	°
Grand Lake	....	....	....	....	61	— 3	71	26	74	30
Greeley	43	— 5	60	—11	68	16	80	28	86	32
Husted	53	—10	56	— 9	65	18	77	23	80	30
Idaho Springs	53	— 2	56	— 2	62	15	....	2	....	17
Julesburg	58	....	62	....	70	....	84	22	88	26
Las Animas	....	....	....	....	....	....	....	....	....	....
Leadville	38	— 9	40	— 9	49	8	58	10	64	15
Longmont	64	— 3	65	—17	72	14	88	24	90	33
Monte Vista	42	—25	42	—25	65	12	77	20	81	23
Montrose	44	— 6	54	— 6	68	23	80	25	84	31
Palmer Lake	52	3	55	— 5	62	19	72	23	75	24
Pueblo	57	—11	65	— 8	73	18	84	32	87	33
Rocky Ford	52	—11	59	— 1	73	23	[d]89	30	90	32
Saguache	....	—25	....	....	69	14	76	16	84	26
T. S. Ranch	....	....	49	4	....	....	....	....	....	....
Thon	....	....	58	— 7	62	14	....	....	82	20
Connecticut:										
Canton	56	6	43	— 8	60	14	82	26	92	36
Colchester	57	9	52	— 3	62	20	76	28	88	31
Fort Trumbull	56	13	48	— 2	60	25	71	30	87	34
Hartford	56	3	40	— 2	63	12	78	26	91	30
Mansfield	57	5	49	— 6	60	17	68	26	....	32
Middletown	56	10	46	0	66	22	78	30	88	34
New Hartford	52	— 2	45	10	60	12	77	22	90	33
New Haven	55	11	49	— 3	62	22	71	32	91	37
New London	55	12	46	1	59	24	68	34	82	40
Shelton	55	12	47	— 1	62	18	73	25	89	32
Southington	57	4	50	— 3	62	19	79	28	91	39
Thompson	55	5	49	— 7	60	16	75	28	89	34
Voluntown	55	10	50	— 2	58	21	72	35	85	42
Waterbury	53	4	43	— 2	65	18	75	28	90	32
Delaware:										
Kirkwood	58	22	....	4	....	28	....	32	....	4
Newark	60	19	47	2	64	25	76	29	....	....
District of Columbia:										
Kendall Green	58	23	48	4	63	30	74	35	88	44
Washington Barracks	....	....	....	....	....	....	80	33	93	39
Washington	66	23	54	4	70	29	83	32	93	39
Florida:										
Altamonte Springs	78	34	85	35	83	40	86	44	95	49
Alva	88	38	89	40	85	42	91	43	98	42
Archer	....	....	....	....	[m]85	[m]46	89	41	96	45
Fort Barrancas	....	....	72	27	78	32	87	39	90	47
Fort Meade	80	32	84	34	83	38	84	39	91	47
Homeland	81	35	84	37	85	46	88	45	96	47
Jacksonville	74	31	81	31	81	39	88	44	94	50
Jupiter	82	40	82	45	78	49	84	52	89	56
Key West	79	54	82	57	79	60	82	65	86	66
Kissimmee	79	34	84	35	85	41	90	42	97	48
Lake City	....	....	....	....	87	34	94	39	99	45
Live Oak	....	....	....	....	....	....	....	....	94	52
Manatee	83	38	84	41	84	41	91	44	90	44
Matanzas	74	34	82	35	77	42	83	50	92	60
Merritt's Island	78	38	82	40	81	46	85	53	93	54
Micco	80	36	85	39	78	47	87	48	98	51
Pensacola	70	33	70	29	76	37	86	48	88	47
St. Francis Barracks	75	32	81	32	79	40	84	45	93	51
Tallahassee	74	26	81	26	80	36	88	46	91	50

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
86	33	87	34	83	37	.....	.....	.....	.....	.....	.....	.....	.....	....
92	36	99	48	97	44	90	29	82	20	60	10	59	6	110
94	33	97	46	90	41	95	27	85	21	60	− 2	64	− 1	107
.....	30	.....	.....	90	41	86	21	.....	.....	61	11	63	3	....
94	43	107	38	100	43	95	28	90	24	64	− 1	.....	.....	....
.....	.....	.....	.....	.....	.....	101	28	91	27	59	8	73	6	....
72	19	77	36	75	38	72	14	66	15	53	− 3	45	4	86
96	36	.....	.....	.....	.....	96	32	91	20	62	8	70	4	....
91	23	93	38	89	38	87	18	78	12	53	−10	50	− 5	118
90	36	96	49	94	49	87	27	83	27	61	10	61	7	102
.....	16	96	45	96	44	91	27	84	19	63	3	68	3	....
97	40	102	52	99	52	97	31	87	29	61	1	68	6	113
98	47	104	62	102	62	98	36	91	27	60	10	70	8	115
91	26	94	41	90	44	.....	.....	82	10	.....	.....	.....	.....	....
95	40	99	[d]55	95	40	86	30	80	21	60	12	60	11	....
88	33	95	41	94	35	89	29	78	19	50	2	62	2	....
91	37	88	50	84	43	84	36	70	23	61	16	61	4	100
84	44	86	50	85	50	81	40	71	28	63	17	65	8	91
88	44	93	51	88	53	82	39	75	31	62	17	58	13	95
91	46	89	52	86	44	83	37	64	24	65	16	65	6	93
86	41	86	49	81	48	81	36	68	27	62	14	63	5	92
88	42	88	50	83	49	82	40	70	24	64	17	66	6	88
92	45	86	40	84	46	80	34	67	18	52	8	54	− 2	102
85	47	88	55	85	50	80	42	72	28	63	20	68	8	94
85	50	86	55	83	53	79	44	68	31	62	23	59	13	85
87	42	87	50	84	48	81	36	70	30	62	19	65	−12	101
91	51	89	56	85	46	85	38	70	27	62	16	64	6	94
87	45	84	55	80	49	79	36	69	28	60	13	62	6	96
86	53	86	56	82	54	81	40	68	30	62	17	60	11	88
90	38	88	49	85	45	83	33	72	27	61	16	63	7	92
.....	60	.....	68	.....	62	.....	46	.....	32	.....	28	.....	22	....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	66	30	68	25	....
93	51	93	59	91	55	89	40	79	33	72	26	70	20	....
90	48	92	59	90	55	86	42	82	34	70	27	72	22	89
94	58	95	60	94	60	94	64	94	48	89	35	82	45	61
99	53	99	70	97	68	94	68	91	44	91	35	85	43	64
98	58	99	69	98	61	97	51	95	37	89	25	84	35	....
91	50	95	69	92	67	95	49	88	44	80	28	80	27	....
91	58	91	74	88	73	88	65	86	43	87	33	80	43	59
95	62	98	73	93	72	92	68	89	46	88	34	82	46	64
95	54	97	70	94	64	95	57	90	45	86	30	80	35	67
92	64	95	72	90	68	90	71	86	54	87	46	79	55	55
89	71	89	71	89	70	89	71	87	.....	86	60	79	63	35
96	57	98	70	96	[f]69	93	65	.....	.....	.....	.....	.....	.....	....
.....	.....	.....	.....	95	52	102	52	91	38	85	23	83	34	....
96	59	98	62	98	62	98	50	88	40	82	34	.....	.....	....
93	64	92	70	93	72	92	69	84	48	92	36	90	44	57
92	62	.....	.....	95	72	90	63	84	41	.....	.....	78	53	....
92	65	91	72	90	71	91	72	89	54	86	43	79	52	55
[f]100	[f]50	[f]98	[f]60	99	60	97	68	88	[f]52	90	39	[c]77	[c]46	64
90	55	94	69	89	67	93	54	84	47	78	32	76	35	65
93	56	94	70	90	68	90	60	84	47	84	35	76	43	62
92	50	95	70	89	64	.....	.....	89	43	79	28	78	32	....

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Florida—Continued.	°	°	°	°	°	°	°	°	°	°
Titusville	79	35	83	38	82	41	86	48	92	53
Villa City	80	35	83	38	83	46	88	53	97	60
Georgia:										
Albany	....	....	....	....	....	....	....	....	95	47
Allapaha	....	....	....	....	....	....	....	....	94	51
Andersonville	....	22	84	19	91	30	98	31	d100	d43
Athens (1)	....	....	....	....	....	....	....	....	96	37
Athens (2)	67	22	73	15	79	29	86	35	94	42
Atlanta	66	18	75	14	78	28	85	34	90	41
Augusta	70	24	78	20	80	31	87	37	99	45
Bainbridge	....	....	....	....	....	....	....	....	92	45
Camak	....	....	....	....	....	....	....	....	95	48
Cartersville	....	....	....	....	....	....	....	....	91	36
Columbus	....	....	....	....	....	....	....	....	91	44
Diamond	....	....	....	....	....	35	....	42	....	45
Duck	60	14	67	9	74	25	80	26	86	34
Eastman	....	....	....	....	....	....	....	....	96	45
Forsyth	78	26	76	20	83	34	88	42	92	50
Fort Gaines	....	....	....	....	....	....	....	....	99	....
Fort McPherson	....	....	....	....	....	....	....	....	....	....
Gainesville	....	....	....	....	....	....	....	....	88	29
Griffin	....	....	....	....	....	....	....	....	93	46
Gillsville	....	....	....	....	....	....	....	....	....	....
Hephzibah	68	30	74	26	76	38	82	46	92	52
Jesup	....	....	....	....	....	....	....	....	l96	l52
Macon	....	....	....	....	....	....	....	....	99	40
Marietta	60	18	68	13	76	30	84	33	87	40
Milledgeville	68	24	78	18	79	29	84	36	93	43
Millen	....	....	....	....	....	....	....	....	97	41
Newnan	....	....	....	....	....	....	....	....	94	42
Point Peter	....	....	....	....	....	....	....	....	....	45
Quitman (1)	75	37	77	28	78	37	87	45	92	46
Quitman (2)	....	....	....	....	....	....	....	....	96	44
Savannah	69	29	81	24	77	34	86	42	96	50
Smithville	....	....	....	....	....	....	....	....	101	45
Thomasville (1)	....	....	....	....	....	....	....	....	96	45
Thomasville (2)	....	....	....	....	80	34	89	40	93	44
Toccoa	....	....	....	....	....	....	....	....	94	36
Union Point	....	....	....	....	....	....	....	....	94	d39
Washington	....	....	....	....	....	....	....	....	94	45
Way Cross	....	....	....	....	....	....	....	....	92	42
Waynesborough	....	....	....	....	....	....	....	....	92	41
West Point	....	....	....	....	....	....	....	....	90	47
Woolley's Ford	....	....	....	....	....	....	....	38	90	50
Idaho:										
Boisé Barracks	40	2	64	7	73	28	84	29	93	33
Boisé City	47	2	64	10	74	30	84	30	92	34
Era	....	....	....	....	....	....	....	....	....	....
Fort Sherman	38	5	53	2	71	25	78	28	86	34
Kootenai	....	....	....	....	....	....	....	....	....	....
Lewiston	46	10	60	17	72	30	80	39	91	44
Soda Springs	....	....	....	....	....	....	....	....	....	....
Illinois:										
Aledo	58	−8	44	−10	70	22	80	22	92	33
Atwood	56	0	60	−10	76	18	....	....	90	32
Aurora (1)	53	−4	46	−9	72	17	75	28	91	32
Aurora (2)	....	....	....	....	....	....	....	....	....	....
Beason	55	−1	52	−6	71	20	76	25	94	30

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
94	61	93	70	93	67	89	66	88	49	85	38	78	48	59
94	65	98	73	95	73	94	71	92	53	85	42	80	50	63
98	50	d98	d70	96	61	93	50	81	49	77	29	....	....	....
96	46	97	58	93	62	93	47	89	36	79	31	....	....	....
99	36	108	66	108	53	100	44	c100	c33	100	28	....	....	89
98	44	100	62	94	58	92	42	80	34	74	22	72	26	....
87	44	94	65	90	63	87	49	80	38	72	24	72	26	79
90	39	95	64	89	60	92	45	81	37	72	23	72	29	81
98	46	100	66	95	61	94	48	88	36	79	24	78	26	80
98	48	98	70	e98	e62	97	50	92	40	82	24	....	....	....
94	44	96	62	92	60	92	46	88	36	76	22	....	....	....
93	41	97	64	90	60	89	43	81	33	72	24	....	....	....
92	56	98	66	....	....	94	48	....	....	78	36	....	....	....
....	48	....	65	....	62	....	48	....	42	....	26	....	32	....
84	41	86	58	82	55	81	38	75	25	68	17	....	....	....
98	54	100	66	98	60	98	60	....	....	....	....	....	....	....
91	52	95	73	92	70	94	56	92	44	84	28	82	32	75
98	48	103	71	100	64	99	64	96	f64	....	....	....	....	....
....	....	....	....	91	59	95	42	84	34	74	22	74	26	....
84	42	90	64	88	60	84	44	78	34	72	22	....	....	....
96	44	96	66	90	62	88	48	84	38	74	22	....	....	....
....	....	90	70	87	64	88	54	81	41	72	26	76	30	....
88	54	90	72	88	68	88	50	84	44	76	30	76	32	66
98	47	101	69	97	60	93	51	87	39	80	23	....	....	....
94	44	96	68	92	60	90	46	88	40	86	29	....	....	....
87	43	91	61	85	59	87	44	80	33	73	23	73	22	78
93	46	95	67	90	60	90	46	84	37	75	24	73	25	77
100	46	100	66	95	55	94	45	88	34	84	22	80	23	....
96	44	94	64	88	60	86	46	78	30	70	24	....	....	....
....	48	....	72	....	67	....	47	....	38	....	25	....	25	....
....	....	....	....	....	....	....	....	85	44	78	29	76	33	....
98	50	98	64	96	64	100	50	92	40	86	26	....	....	....
96	50	95	70	90	64	91	55	87	42	83	29	77	32	72
98	46	100	68	98	56	100	44	....	....	n94	20	....	....	....
98	48	102	69	94	62	98	49	92	38	h82	h26	....	....	....
96	48	97	69	92	62	96	48	90	39	83	26	79	30	....
90	42	94	62	88	60	88	44	80	32	....	....	....	....	....
94	48	98	60	90	60	92	42	84	28	78	20	....	....	....
92	45	94	62	88	62	88	50	82	36	78	24	....	....	....
92	50	94	70	92	66	98	44	....	....	78	28	....	....	....
91	48	94	65	90	62	89	47	85	36	74	24	....	....	....
94	51	96	72	92	66	90	52	84	42	88	28	....	....	....
86	48	90	64	86	62	82	52	74	38	68	24	72	22	....
98	43	102	42	100	45	88	27	85	26	57	20	53	8	100
98	45	102	44	101	44	88	28	91	30	59	23	53	12	100
....	....	94	45	96	38	92	29	89	20	56	9	49	0	....
90	40	94	43	86	38	86	26	85	30	68	24	44	0	94
....	....	....	....	88	38	....	....	86	29	56	17	42	4	....
99	58	101	58	95	52	88	34	....	....	56	26	48	10	....
89	24	94	26	92	42	80	18	78	5	46	—6	45	—18	....
94	44	....	....	....	....	....	....	....	....	....	....	....	....	....
86	42	90	52	94	52	....	....	....	....	....	....	....	....	....
88	42	93	51	....	....	91	29	83	24	58	5	65	13	....
....	....	....	....	....	....	89	28	78	23	58	2	61	12	....
90	43	90	56	88	51	89	33	77	28	56	3	65	15	100

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Illinois—Continued.	°	°	°	°	°	°	°	°	°	°
Belvidere	50	—6	43	—15	68	22	73	45	86	28
Brush Hill	60	—2	58	—4	74	26	81	33	94	43
Cairo	61	19	70	6	75	27	81	34	88	41
Cedarville	48	—7	45	—16	70	19	76	23	86	37
Centralia	60	12	74	0	74	26	85	31	91	42
Charleston	58	6	64	—4	74	21	79	24	94	30
Chicago	55	0	48	—11	68	20	73	29	88	36
Collinsville	62	12	66	—1	73	24	81	28	88	39
Dwight	57	—8	50	—12	74	10	76	25	90	28
Fairfield	62	18	73	5	77	27	....	....	92	42
Flora	60	14	70	2	78	21	84	28	94	34
Fort Sheridan	49	3	45	—17	64	14	74	23	89	35
Gibson City	53	—3	....	....	....	....	70	28	....	....
Golconda	58	16	64	8	78	26	84	34	90	42
Greenville	62	9	65	—1	75	22	78	26	90	35
Griggsville	60	2	58	—4	70	26	80	30	94	47
Hennepin	58	—3	52	—7	77	16	79	23	94	29
Irishtown	63	13	66	1	76	29	....	....	90	42
Jordan's Grove	62	16	70	3	76	25	....	....	92	36
Lacon	57	4	52	—8	75	24	79	26	93	38
Lake Forest	50	—1	44	—13	62	16	74	27	88	31
Lanark	46	—3	44	—12	74	21	73	26	84	39
Louisville	....	....	....	....	....	....	....	....	....	....
Martinsville	50	10	50	2	75	22	76	40	....	....
Mascoutah	60	10	....	....	70	28	84	28	89	40
Mattoon	63	6	63	—2	75	20	81	25	92	31
McLeansborough	62	16	73	4	77	23	86	29	94	39
Mount Morris	51	—8	44	—11	70	20	75	26	93	35
Olney	52	—13	71	3	74	26	83	32	91	39
Oneida	56	—6	48	—10	72	20	78	28	90	34
Oswego	52	—6	43	—12	68	20	73	29	90	30
Ottawa	57	—6	49	—11	72	22	75	30	88	40
Palestine	59	14	61	1	74	24	81	33	88	36
Pana	62	12	66	—4	76	30	82	33	90	44
Pekin	60	—3	50	—10	74	18	81	23	92	31
Peoria	60	0	52	—5	75	23	79	30	92	35
Petersburgh	62	4	56	0	74	22	78	28	....	....
Philo	56	2	60	—5	73	16	76	29	90	28
Pontiac	54	—4	52	—8	78	14	78	22	94	26
Quincy	....	....	....	....	....	....	....	....	90	33
Richview	61	13	69	1	73	24	80	28	90	36
Riley (Marengo)	48	—6	40	—15	67	18	71	25	86	34
Rockford	46	—4	44	—14	67	21	74	23	85	32
Rock Island Arsenal	55	—4	50	—11	68	21	75	26	85	36
Sandwich	55	—5	48	1	73	23	75	32	92	40
South Evanston	52	—3	46	—12	65	15	f77	f28	94	31
Springfield	58	2	56	—5	73	22	78	26	88	35
Sumner	58	10	70	0	76	22	84	28	90	34
Sycamore	49	—4	44	—11	69	18	72	25	88	32
Watseka	56	—3	57	—7	72	19	76	27	94	28
Wheaton	48	—6	....	....	70	18	....	....	....	....
White Hall	60	6	56	—2	72	24	80	28	86	34
Willow Hill	56	14	66	4	72	27	80	31	....	....
Windsor	58	5	64	—3	67	21	80	23	88	33
Winnebago	52	—8	44	—16	70	20	78	26	90	36
Woodstock	49	—11	....	....	....	....	....	....	....	....
Indiana:										
Angola	52	9	51	—10	63	14	80	28	96	32
Blue Lick	55	17	65	4	74	17	81	26	90	36

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
97	48	91	56	94	51	88	32	80	20	53	2	58	15	112
96	50	98	62	96	61	93	40							....
90	46	91	62	88	62	88	45	83	36	73	20	74	26	85
88	37	90	59	91	56	88	37							....
95	50	96	60	92	59	90	40	82	27	60	14	70	18	96
		93	54	92	53			85	26					....
86	42	90	54	88	54	84	35	79	35	57	12	64	15	101
93	46	94	57	90	56	88	39	80	33	61	15	73	19	95
90	41	94	52	98	45	93	31	83	24	60	2	65	15	110
92	50	92	62	92	60	92	40							....
92	41	93	53	89	50	87	33			72	14	71	19	....
86	39	91	52	95	46	84	31	78	26	58	7	60	13	112
								82	26	53	0	66	12	....
92	51	92	66	90	63	89	44	84	34	72	18	74	21	84
92	44	95	53	94	53	93	35	86	29	64	11	71	16	96
94	59	91	60	92	61	91	40	85	31	55	11	67	11	98
91	40	96	52	95	47	92	30	83	22	60	5	69	5	103
92	51	94	63	91	60	90	40							....
92	50	92	58	90	57	90	37	88	30	62	16	72	21	....
87	46	93	66	94	57	89	39	85	27	58	8	63	12	102
84	36	90	50	90	49	84	30	76	28	54	6	60	9	103
85	44	89	57	92	54	88	32	76	27	65	8	61	9	104
		92	59	91	57	87	36	82	29	69	12	70	24	....
92	45							82	32	60	14	68	24	....
94	46	94	57	90	55	90	39	78	28	70	28	76	16	....
95	44	96	57	93	54	91	34	84	22	58	8	66	20	98
		102	55	96	54	96	40	85	30	70	13	72	21	....
91	46	95	52	98	52	91	28	84	18					....
93	47	95	62	91	59	87	41	81	31	65	14	70	22	108
92	40	96	61	98	60	94	39	86	28	58	0	66	8	108
90	46	92	54	94	49	92	28	80	24	57	4	62	12	106
90	47	93	62	91	56	93	38	73	29	63	8	64	18	104
90	44	92	52	90	54	87	39	81	30	69	15	72	23	91
93	52	94	64	90	65	89	42	80	32	60	10	70	20	98
96	41	96	55									66	10	....
92	46	94	57	93	55	91	36	80	28	59	7	65	14	99
96	44	93	52	92	48	93	28	82	20	64	14	67	16	101
90	42	96	52	98	48	94	32	80	26	58	2	64	14	106
93		97	53	98	55	98	33	88	28					....
92	44	95	56	91	54	91	36	87	28					....
84	42	88	55	91	51	86	27	78	28	52	5	58	11	106
86	42	92	52	92	47	89	32	78	21	53	7	61	14	106
86	36	91	50	92	54	87	34	83	28	59	5	65	10	103
90	50	95	61	92	55	93	38	81	29	60	5	65	18	100
88	38	92	49	[e]93	[e]45	85	31	[g]80	[g]27	57	13			....
90	42	91	56	90	54	88	37	80	30	59	7	67	14	96
85	39	93	51	92	48	89	29	82	22	52	0	60	12	104
91	40	95	52	92	47	89	32	82	24	60	1	65	18	102
86	44	93	60			90	32	78	28	56	2	60	12	....
90	40	90	62	94	60	88	40	78	34	56	12	70	14	96
86	46	88	62											....
89	39	94	57	90	52	88	35	80	28	64	8			97
92	45	94	58	98	56	96	33	82	26	54	6	62	11	114
82	37									50	— 1	56	6	....
92	43	97	54	92	50	90	34	77	27	55	17	61	17	107
89	44	89	60	88	58	87	40	79	30	72	17	66	27	86

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°
Indiana—Continued.										
Butlerville	58	16	70	0	76	23	77	26	84	39
Cannelton	58	19	70	8	76	21	85	28	92	34
Columbia City	55	2	56	— 1	62	19	75	25	91	32
Columbus	52	16	62	2	72	24	78	26	89	35
Connersville	53	10	64	1	73	24	80	25	89	40
Dana	50	6	58	— 4	70	22	79	27	92	[f]28
De Goma Springs	57	20	67	7	72	26	80	30	85	38
Delphi	58	2	59	— 3	70	14	76	20	91	25
Farmland	54	6	62	2	70	18	80	24	90	32
Franklin	54	11	65	0	69	26	81	27	90	30
Huntertown	.....	.....	50	2	58	24	70	28	90	36
Huntingburgh	58	18	66	4	76	28	80	31	91	38
Indianapolis	58	10	64	— 1	71	22	80	23	90	35
Jeffersonville	57	21	67	7	73	25	84	28	90	37
Laconia	56	17	68	6	79	24	86	28	97	34
La Fayette	58	1	59	— 8	71	19	81	22	93	31
Marengo	61	22	66	9	81	25	84	35	91	37
Marion	55	4	56	— 1	62	22	76	26	88	31
Mauzy	54	4	62	— 3	69	19	79	20	91	29
Mount Vernon	57	19	64	5	72	26	.....	.....	91	40
Muncie	54	10	66	0	72	26	80	30	91	36
New Providence	58	15	68	2	76	18	86	23	94	30
Point Isabel	.....	.....	.....	.....	80	20	80	22	90	32
Princeton	57	15	67	2	76	27	81	30	91	39
Richmond	55	8	60	1	69	17	80	23	90	28
Rockville	48	7	64	— 4	70	22	72	28	90	30
Salem	56	17	64	2	.....	22	79	28	88	38
Scalesville	56	19	68	6	78	27	83	30	94	39
Seymour	56	20	64	4	70	27	80	28	90	40
Shelbyville	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Spiceland	56	12	67	0	72	22	79	23	90	30
Sunman	55	10	63	1	72	22	82	22	89	31
Vevay	58	15	71	5	76	20	86	25	94	35
Worthington	56	12	66	0	73	22	78	28	88	35
Indian Territory:										
Caddo Creek	76	5	80	12	80	26	90	42	[g]88	48
Fort Gibson	64	8	78	12	80	25	87	38	85	35
Fort Reno (1)	69	74	74	6	77	22	89	34	92	34
Fort Reno (2)	59	10	73	6	77	22	[d]87	34	[e]90	32
Fort Sill (1)	71	18	76	7	79	25	88	41	92	38
Fort Sill (2)	.....	.....	.....	.....	80	25	88	41	92	38
Fort Supply (1)	62	12	80	— 1	78	18	90	34	100	35
Fort Supply (2)	62	18	75	3	83	22	89	36	98	32
Jimtown	74	15	.....	.....	76	.....	.....	.....	.....	45
Lehigh	.....	.....	.....	.....	.....	.....	.....	50	.....	46
Oklahoma	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Iowa:										
Amana	48	— 8	47	—14	66	17	76	21	86	31
Ames	44	— 6	48	—16	68	18	80	26	86	38
Bancroft	41	— 7	36	—24	73	12	82	30	[m]80	44
Belle Plaine	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Blakeville	.....	— 4	48	—21	80	18	80	30	83	36
Carroll	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Carson	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cedar Rapids	50	— 6	47	—15	69	18	78	22	84	29
Clarinda	44	0	59	— 6	73	17	85	24	88	38
Clinton	54	— 8	46	—10	72	20	80	22	92	22
Cresco	39	—13	40	—27	68	13	80	20	80	29

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
84	76	85	64	84	60	77	40	72	30	70	9	65	23	85
95	44	94	52	92	59	90	38	83	30	62	16	71	19	87
92	40	93	50	93	47	92	34	66	25	56	15	64	18	94
90	45	90	60	....	....	....	44	78	31	68	16	66	24	....
88	40	90	58	89	55	90	40	79	25	67	8	66	20	89
92	44	[d]92	[d]58	93	55	93	37	[e]89	[e]27	58	9	[e]70	[e]25	97
88	47	88	60	86	55	86	41	79	29	71	19	70	25	81
....	....	92	50	89	46	89	30	78	23	61	7	64	16	....
87	42	92	60	90	52	94	34	80	26	64	16	64	26	92
90	46	....	....	....	....	89	37	79	29	65	11	67	21	....
85	46	92	60	91	59	[m]90	[m]56	....	....	....	....	....	....	....
90	49	94	62	90	59	88	48	81	25	72	14	68	28	90
89	41	92	57	91	51	90	39	80	29	67	12	68	24	93
92	46	92	58	90	54	90	40	80	30	74	21	69	21	85
98	45	....	....	....	....	....	....	....	....	....	....	....	....	....
89	40	95	53	93	50	92	32	80	24	61	5	68	19	103
91	48	90	59	93	58	93	41	86	33	75	19	71	20	84
87	42	92	53	90	48	91	38	70	25	62	6	66	20	93
93	39	96	51	91	43	92	31	74	20	63	0	65	12	99
93	47	94	58	89	57	88	41	80	32	70	17	68	25	....
92	42	96	61	....	....	....	....	....	....	....	....	65	25	....
94	41	[g]96	[g]54	[k]89	[k]51	[i]91	[i]32	....	....	....	....	....	....	....
94	42	98	54	96	55	92	30	....	25	....	9	66	22	....
91	46	96	60	93	55	89	36	81	30	71	14	70	24	94
87	44	91	54	90	48	91	31	78	17	65	10	68	15	90
92	42	94	62	90	54	94	36	80	26	70	8	76	19	98
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
91	44	93	64	92	59	91	43	85	32	74	19	74	28	88
88	46	88	62	87	48	88	39	78	27	68	16	67	24	86
....	....	90	60	89	57	....	....	80	31	60	14	66	28	....
93	41	94	54	93	47	93	36	79	25	65	7	67	19	94
90	40	92	53	89	43	91	33	45	22	70	6	68	19	91
92	44	94	57	91	54	94	40	80	28	76	10	72	18	89
86	46	86	63	87	58	83	38	76	30	68	12	64	23	87
91	62	[g]96	[g]72	[l]98	[l]64	94	44	....	....	73	18	[k]76	[k]26	....
94	47	100	60	96	55	91	38	86	30	70	20	78	22	92
92	51	103	53	100	58	92	41	94	31	75	18	79	14	97
92	50	103	65	100	56	92	39	92	29	75	17	74	14	97
94	54	103	60	102	59	94	38	94	35	78	20	77	21	96
96	53	104	58	104	57	96	38	94	35	97	19	78	21	....
97	50	111	51	103	57	95	35	97	29	75	17	81	11	112
95	50	105	53	97	59	93	30	96	32	75	18	80	14	102
....	61	[l]88	[l]56	....	62	....	46	....	....	....	....	....	....	....
....	60	....	64	....	64	....	44	85	31	....	....	....	....	....
[h]93	[h]50	100	56	100	56	92	38	....	....	....	....	....	....	....
89	41	94	46	91	47	87	30	80	22	58	3	64	8	108
89	48	92	50	94	47	90	32	84	20	60	2	64	4	...
93	48	95	46	94	60	90	26	83	17	55	—3	52	2	119
....	....	....	....	92	56	90	28	82	28	60	2	66	6	....
95	48	102	60	104	54	93	32	87	26	68	0	66	6	125
....	....	....	....	[k]90	[k]52	....	40	....	26	[h]58	4	65	5	....
....	....	....	....	92	56	91	40	83	26	55	7	67	6	....
90	35	95	47	93	47	89	26	81	24	56	5	64	10	110
92	48	93	59	92	56	86	34	82	31	61	6	68	2	99
94	43	96	52	94	51	91	29	82	24	58	5	65	10	106
87	35	92	46	94	42	86	26	81	22	55	—2	57	3	121

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°
Iowa—Continued.										
Cromwell	....	2	....	−9	....	....	....	[f]37	....	33
Davenport	55	−1	48	−12	69	23	76	25	86	37
Denmark	52	....	50	....	66	...	72	32	84	38
Des Moines (1)	50	−3	45	−15	66	15	82	24	87	32
Des Moines (2)	50	−1	52	−13	69	16	82	24	85	34
Dubuque	52	−4	45	−16	70	23	78	25	85	36
Dunkerton	....	....	47	−19	[e]69	[e]19	[f]82	[f]26	[g]84	[g]36
Dysart	45	−10	44	−19	63	15	82	16	81	34
Eagle Grove	....	....	....	....	....	....	....	....	85	32
Elkader	[i]46	[i]−14	40	−22	65	20	78	26	82	42
Fayette	47	−13	42	−25	68	12	78	10	83	27
Fort Madison (near)	56	−2	52	−7	67	22	76	:0	89	38
Gillett	....	−7	....	−16	....	18	....	32	....	43
Glenwood (1)	44	−4	62	−11	76	14	86	28	92	34
Glenwood (2)	48	−4	58	−12	70	8	82	22	90	30
Grinnell	45	−2	45	−14	68	15	78	18	83	33
Hampton	39	−6	42	−22	67	14	82	19	83	32
Humboldt	40	−10	44	−21	66	10	[d]78	[d]15	[d]82	24
Independence	42	−2	38	−18	63	21	76	....	79	42
Iowa City	49	1	43	−11	60	21	73	24	80	37
Keokuk	62	1	62	−8	68	21	80	28	86	38
Logan	48	0	54	−11	70	12	84	21	90	28
McCausland	....	....	....	....	....	....	....	....	....	....
Manson	44	−8	52	−22	68	16	74	32	84	34
Maquoketa	52	....	46	....	70	....	77	26	86	40
Monticello	46	−6	44	−18	68	16	78	19	86	32
Mount Pleasant	55	0	52	−6	65	25	77	33	82	43
Mount Vernon	51	−6	48	−18	....	....	81	30	87	41
Muscatine	53	−9	49	−8	70	22	76	25	87	31
Osceola	....	−7	....	−12	....	20	....	30	....	....
Oskaloosa (1)	50	−4	52	−10	71	20	82	30	86	40
Oskaloosa (2)	....	....	....	....	....	....	85	30	90	34
Sac City	43	−8	45	−17	66	15	78	31	86	40
Sioux City	....	....	....	....	....	....	....	....	....	....
Storm Lake	....	....	....	....	....	....	....	....	....	....
Vinton	45	−6	42	−16	67	18	77	26	81	37
Washington	55	−4	50	−9	76	21	83	27	92	34
Webster City	....	....	46	−16	68	20	81	26	88	31
Wesley	40	−8	44	−28	66	10	52	18	88	26
West Bend	....	....	....	....	....	....	....	....	....	....
Kansas:										
Allison	54	−2	55	−4	70	14	89	37	90	40
Augusta	....	....	....	....	....	....	....	....	88	42
Belleville	47	....	50	−8	68	....	....	....	90	40
Bendena	....	16	52	7	....	36	....	46	....	50
Brookville	60	10	68	−2	82	20	96	28	98	38
Buffalo Park	54	4	55	−2	72	30	89	24	90	44
Bunker Hill	60	10	64	−5	82	16	92	36	98	41
Burr Oak	50	5	....	....	66	15	84	30	92	29
Carneiro	56	11	62	−5	70	22	90	34	....	....
Cawker City	51	0	55	−10	72	19	84	42	93	41
Colby	53	−9	52	−11	70	18	85	28	93	28
Collyer	52	8	55	−2	70	25	90	33	98	32
Concordia	56	3	56	−7	73	18	87	36	89	34
Concordia (6 miles NW.)	58	−8	58	−12	76	12	....	....	92	26
Conway	....	....	....	−5	....	....	90	32	90	31
Cunningham	57	10	69	−4	77	10	92	37	95	39
Dodge City	58	11	60	−8	78	21	88	35	94	38

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
....	43	....	65	....	....	....	....	....	....	....	....	....	....	....
89	39	92	55	92	54	86	33	81	27	58	5	65	10	104
88	....	89	....	....	....	....	....	....	....	....	....	....	....	....
90	36	....	....	94	45	....	....		....	65	3	69	5	....
88	37	91	51	93	47	86	31	85	26	63	4	69	8	106
88	42	95	50	94	50	90	31	79	22	60	8	67	10	111
[d]94	[b]50	....	....	....	....	....	....	....	....	....	....	....	....	....
86	45	92	53	90	55	....	....	....	....	....	....	....	....	....
90	49	94	53	94	49	88	32	84	18	64	—5	58	—2	....
90	43	94	56	94	50	90	30	74	18	52	2	60	4	116
88	38	94	40	97	37	90	23	80	16	56	0	62	4	122
94	50	95	62	93	60	90	33	76	28	56	8	66	8	102
....	53	....	59	....	56	....	34	....	20	....	....	....	....	....
95	40	98	53	94	54	96	34	84	20	65	3	76	4	109
96	36	98	48	92	52	88	28	94	24	58	4	66	2	110
87	39	90	53	90	48	85	33	79	28	54	2	65	7	104
90	35	93	46	94	42	87	28	82	16	57	—6	60	2	116
[a]90	[d]32	....	....	[b]93	41	[a]87	26	82	15	60	—5	58	5	....
84	48	92	....	87	63	84	....	73	29	56	....	61	10	....
88	47	91	53	85	52	82	36	73	31	54	13	63	17	102
89	43	91	54	93	55	87	33	80	31	58	8	69	10	101
98	36	94	48	94	48	87	30	82	20	58	3	65	5	109
....	....	....	....	92	58	86	36	85	24	56	6	....	....	....
92	42	94	52	92	52	88	32	76	27	60	8	60	8	116
90	48	96	58	94	55	90	32	81	20	60	8	65	8	....
90	40	95	47	93	49	90	28	79	20	57	2	65	4	113
87	52	89	61	87	60	84	38	76	32	55	8	67	11	95
92	50	96	57	93	55	91	33	82	29	56	2	64	5	....
91	45	94	51	91	50	89	31	84	22	57	7	67	9	103
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
90	49	93	58	94	56	88	34	78	28	62	1	67	6	104
94	40	98	53	98	48	....	....	....	....	....	....	....	....	....
88	43	88	53	90	52	80	34	82	22	64	0	60	5	107
....	....	92	58	92	55	85	36	84	22	58	2	62	5	....
....	....	92	....	89	60	84	35	76	20	53	2	54	5	....
86	47	91	49	91	47	86	32	80	19	59	1	65	6	107
98	47	98	54	98	54	93	32	82	28	58	6	56	10	107
92	42	94	53	96	52	91	30	86	20	55	—2	58	2	....
91	33	94	44	92	39	88	25	82	12	54	—9	54	3	122
....	....	96	55	90	54	87	30	78	21	51	—1	51	4	....
....	52	99	49	95	50	....	47	90	24	60	12	....	4	....
96	56	100	62	98	62	94	40	90	32	....	....	74	4	....
90	....	94	....	90	....	....	....	....	....	....	....	63	18	....
....	61	94	63	....	58	79	46	....	35	49	9	....	13	....
107	60	107	56	105	60	....	....	....	....	60	11	76	8	....
98	54	102	64	106	64	96	40	87	33	62	14	65	18	108
100	54	106	62	104	62	98	42	92	32	62	12	68	12	111
96	44	97	47	93	45	89	32	86	24	55	8	68	2	....
....	....	103	60	96	62	92	42	91	30	62	12	72	10	....
92	54	86	66	91	60	92	40	84	27	64	15	70	7	103
96	42	106	58	....	....	....	....	....	....	....	....	....	....	....
104	52	106	58	98	56	102	50	92	35	61	....	66	25	....
91	50	97	51	95	53	92	34	85	28	62	10	72	4	104
....	....	92	50	92	56	90	30	86	26	58	8	74	2	....
92	52	98	56	96	49	94	36	90	30	70	12	76	10	....
95	48	99	59	94	53	96	36	95	28	71	12	75	3	103
93	48	105	53	97	55	95	32	94	28	66	16	72	10	113

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Kansas—Continued.	°	°	°	°	°	°	°	°	°	°
Dorrance	58	9	64	−10	80	20	94	25	100	42
Elco	....	....	....	....	....	....	89	32	92	35
Elk Falls	60	7	73	0	80	20	90	33	87	34
Ellis (1)	60	16	58	− 4	73	20	88	38	....	....
Ellis (2)	....	....	....	....	....	....	....	....	94	35
Ellsworth	57	12	65	− 4	70	18	95	38	98	35
Emporia	54	4	68	− 5	74	18	89	32	89	35
Englewood	58	12	66	4	81	25	88	39	98	40
Fort Hays	56	5	60	−12	74	12	89	31	92	30
Fort Leavenworth	52	3	66	− 6	74	20	89	30	87	38
Fort Riley	51	0	66	−10	76	16	88	31	91	32
Fremont (Atkin)	....	....	....	....	....	....	....	....	94	25
Gibson	55	4	56	−14	76	16	90	31	100	28
Globe	51	4	66	− 5	70	20	84	38	80	40
Gorham	58	10	60	−12	74	24	90	36	94	38
Grainfield	54	14	60	− 2	76	26	83	36	84	34
Grenola	54	13	76	4	81	18	90	34	93	38
Grinnell	56	4	60	− 4	76	20	94	34	96	38
Halstead	54	8	69	− 6	73	14	84	32	90	33
Havensville	48	2	54	−14	74	14	90	34	93	35
Hays City	57	10	67	0	79	28	88	38	95	50
Horton	....	....	....	....	....	....	94	28	93	37
Hugoton	52	10	....	....	....	....	90	39	100	46
Independence	55	7	69	− 4	77	20	85	36	87	41
Kanopolis	56	10	64	− 9	72	31	90	30	95	40
Kellogg	....	....	....	....	....	....	....	....	....	....
La Harpe	....	10	....	1	64	26	....	43	....	48
Lawrence	49	7	65	− 4	77	13	83	25	89	38
Leavenworth	52	4	66	− 5	72	21	89	30	89	37
Leavenworth Mil. Prison	52	4	56	− 5	69	19	81	32	86	37
Lebo	54	5	70	− 6	79	17	89	26	93	32
Leoti	....	− 6	....	−10	....	20	90	30	96	32
Lincoln	....	....	....	....	....	....	....	....	....	....
Lisbon	....	....	....	....	74	26	....	....	98	42
McAllaster	50	− 8	58	−17	72	20	80	30	96	38
Macksville	55	10	62	−10	78	16	90	32	95	35
Manhattan (1)	48	− 2	53	−11	74	14	89	25	94	30
Manhattan (2)	....	....	....	....	....	....	....	....	90	34
Monument	56	0	58	−10	70	20	88	28	92	32
Morse	50	0	60	−10	62	14	80	36	90	30
Oakley	52	2	58	− 5	74	26	96	34	96	38
Offerle	....	....	....	....	80	21	86	36	100	40
Ogallah	55	15	58	− 8	72	30	90	42	95	42
Quinter	52	5	56	−10	74	24	87	36	95	43
Richfield	....	....	....	....	....	....	....	....	....	....
Rome	55	10	78	− 6	77	18	86	32	88	42
Russell	56	10	52	− 8	86	14	85	38	86	34
Salina	57	8	64	− 4	76	16	88	41	92	35
Santa Fé	63	5	67	−10	79	18	....	....	....	....
Sedan	58	6	72	− 2	80	24	85	38	88	40
Seneca	48	− 6	55	−16	75	20	88	36	92	40
Sharon Springs	....	....	....	....	....	....	....	....	....	....
Topeka	53	3	69	−13	72	16	90	23	89	30
Tribune	53	− 8	54	−15	72	20	87	28	97	34
Victoria	54	12	62	− 6	74	18	90	30	92	30
Wa Keeney	50	10	56	− 8	72	18	84	38	92	45
Wakefield	51	3	66	− 8	72	20	90	38	94	36
Walker	54	9	58	−10	80	22	92	32	94	40

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
102	50	104	54	99	67	98	46	99	27	64	13	74	6	114
94	50	....	....	94	55	91	36	89	28	....	....	....	....	....
95	55	96	57	97	60	91	38	....	....	66	20	80	29	....
....	....	106	51	98	49	96	30	89	29	71	14	72	4	....
94	58	104	58	94	68	92	50	82	38	70	20	67	10	....
96	56	102	60	100	57	100	45	85	40	70	14	60	18	106
92	49	97	58	94	62	90	41	85	31	67	12	72	9	102
102	56	102	62	96	60	94	37	97	32	68	18	74	12	98
93	44	106	47	101	46	99	33	90	29	....	....	....	....	....
92	44	93	55	91	56	90	34	86	32	66	9	73	7	99
94	50	98	55	94	55	93	36	89	33	63	11	73	5	108
....	....	....	....	103	42	102	31	90	20	68	10	73	1	....
100	50	114	47	106	45	100	30	....	....	....	....	....	....	....
90	56	93	62	89	62	88	41	85	29	67	10	71	7	98
96	55	104	63	98	68	90	44	....	....	63	13	70	4	....
90	48	98	44	99	56	99	50	86	35	65	17	66	10	101
96	57	102	52	99	62	96	40	90	38	72	17	74	9	98
102	50	106	60	108	60	96	42	90	39	66	18	76	13	112
92	51	96	56	94	55	90	35	88	32	68	11	70	5	102
96	53	99	58	96	53	98	37	92	31	68	8	68	3	113
96	57	108	65	98	67	95	45	80	40	70	12	68	10	108
92	56	94	58	93	57	96	41	94	32	....	....	....	....	....
....	....	105	63	....	....	....	....	....	....	....	....	....	....	....
92	56	101	58	98	54	98	41	86	32	72	14	75	10	105
96	60	100	60	98	62	88	40	92	30	60	11	69	3	109
....	....	....	....	....	....	96	38	90	34	69	14	72	4	....
....	58	....	68	....	66	....	48	....	39	....	16	....	11	....
90	52	94	56	89	57	89	38	85	29	65	11	72	11	98
91	49	93	56	92	55	91	35	87	28	67	10	73	11	98
92	45	91	58	91	59	88	39	85	29	60	8	70	7	97
94	48	99	53	98	53	95	33	93	28	73	12	74	6	105
....	....	108	45	100	48	94	22	....	....	....	....	....	....	....
....	....	....	....	93	59	99	38	85	28	60	14	73	5	....
100	56	108	65	104	58	100	38	90	30	64	10	72	16	....
98	50	108	60	102	52	98	28	90	28	65	14	66	11	125
97	42	100	52	97	50	95	30	98	33	....	....	71	4	....
97	41	98	50	97	51	101	30	96	26	66	11	75	0	112
96	54	96	62	98	56	92	32	91	28	64	10	70	0	....
98	48	108	60	100	60	96	30	88	28	60	10	68	6	118
90	50	90	50	88	54	82	34	80	28	60	18	60	18	100
92	50	106	58	106	64	102	44	88	36	62	14	70	7	111
93	52	....	....	98	60	97	35	95	33	70	10	72	5	....
95	55	102	65	101	65	95	40	88	30	62	15	68	15	110
94	53	100	60	104	60	94	38	90	30	60	7	68	4	114
....	....	....	....	....	....	....	....	98	35	70	20	80	18	....
94	50	100	58	96	58	92	36	90	33	74	15	74	8	118
91	53	98	55	96	56	90	38	86	32	58	12	68	10	106
96	54	98	56	93	61	91	47	92	36	[1]58	[1]28	70	12	102
....	....	....	....	102	55	97	30	....	....	....	....	....	....	....
99	52	103	59	100	60	100	42	90	34	76	16	75	11	105
91	56	94	60	94	56	95	34	93	27	64	7	70	1	111
....	....	[1]102	[1]60	100	60	92	36	88	29	....	....	70	17	....
93	43	94	53	91	48	91	33	90	26	67	9	74	4	107
99	43	105	48	102	48	96	28	90	28	60	14	66	8	120
95	55	103	60	98	57	96	39	86	29	68	15	70	10	109
92	54	99	60	99	60	92	46	92	38	64	17	70	10	107
98	58	100	62	98	59	....	....	....	....	....	....	....	....	....
98	56	104	62	100	60	96	34	90	30	64	12	70	2	114

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°
Kansas—Continued.										
Walnut Grove	....	....	....	....	78	20	....	....	92	36
Wellington	55	10	78	— 5	72	21	85	33	85	35
Weskan	....	....	....	....	....	....	....	....	96	37
Wichita	54	10	72	— 2	75	6	90	36	88	37
Wilson	57	10	60	— 5	73	16	90	40	89	42
Winona	56	10	55	— 4	72	26	90	32	96	32
Yates Center	54	4	70	— 6	80	16	89	29	86	34
Kentucky:										
Ashland	57	13	63	4	66	18	71	25	81	36
Bernstadt	....	....	65	5	76	25	85	26	90	41
Bowling Green	61	16	74	9	82	22	87	28	[d]91	37
Canton	....	....	....	....	....	....	....	....	....	....
Earlington	....	....	....	....	....	....	....	....	....	....
Falmouth	54	19	62	8	70	22	83	28	89	45
Frankfort	57	19	71	7	79	21	87	26	94	31
Franklin	64	21	65	21	78	28	85	38	90	41
Lexington	58	16	69	6	75	24	82	24	89	38
Louisville	60	17	68	6	76	24	85	29	90	37
McHenry	....	....	....	....	[f]76	[f]26	[e]87	[e]38	[d]94	[d]42
Madisonville	59	20	66	11	74	27	82	32	88	39
Millersburgh	60	23	68	9	72	28	77	34	....	....
Mount Sterling	56	17	68	8	75	24	86	27	88	41
Murray	....	....	....	....	....	....	....	....	....	....
Newport Barracks	58	18	68	6	76	22	84	25	93	35
Owensborough	60	20	68	8	[d]77	[d]26	[e]82	[e]30	[d]92	[d]43
Owenton	55	18	65	3	78	23	89	24	89	37
Pellville	65	17	74	6	84	22	87	28	93	33
Richmond	58	18	65	5	73	25	[f]84	25	93	35
Shelbyville	56	20	72	6	78	22	85	25	93	28
South Fork	64	20	71	8	77	22	84	30	89	37
Springfield	....	....	....	....	....	....	....	....	....	....
Louisiana:										
Abbeville	72	32	76	33	78	42	83	55	88	56
Alexandria	....	....	76	30	82	34	88	45	91	42
Amité City	74	26	76	26	79	34	85	45	91	43
Arcadia	76	24	81	24	83	....	86	45	....	....
Baton Rouge	70	31	73	31	77	42	85	....	88	....
Cheneyville	71	25	....	....	....	....	....	....	89	42
Cameron	72	30	84	23	85	41	94	52	101	51
Clinton	72	21	74	26	79	31	87	43	95	40
Convent	73	29	74	29	81	35	89	44	94	46
Coushatta	....	....	....	....	....	....	....	....	91	45
Crowley	70	27	70	34	77	39	86	51	91	45
Donaldsonville	....	....	74	29	78	36	84	47	90	47
Emilie (Mount Airy)	72	33	74	34	79	41	90	47	94	49
Farmerville	68	26	80	26	80	31	84	48	89	42
Franklinton	74	31	79	34	76	39	82	51	91	43
Grand Cane	68	21	82	28	82	35	85	50	89	47
Grand Coteau	70	33	73	34	76	42	84	51	89	50
Hammond	73	27	77	27	80	33	88	43	94	42
Houma	71	33	75	35	79	37	[f]85	50	90	48
Jackson Barracks	....	....	79	32	80	34	88	48	90	42
Jeanerette	....	....	....	....	....	....	84	55	....	54
Jennings	....	....	....	....	....	....	89	50	92	47
La Fayette	....	....	....	....	....	....	86	52	92	46
Lake Charles	70	33	73	34	81	42	90	41	94	43
Lake Providence	76	22	82	17	86	44	92	49	91	40
Liberty Hill	72	23	84	22	84	28	88	42	93	42

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
86	52	94	61	....	....	....	....	....	....	....	....	....	....	....
92	53	95	56	98	57	93	37	93	31	67	14	74	6	103
105	40	105	47	102	40	99	38	90	30	64	22	65	12	....
94	51	96	57	96	59	89	40	91	34	72	15	73	10	98
94	55	101	65	97	65	95	38	88	29	60	12	70	8	106
94	44	102	48	99	54	98	36	88	30	68	15	70	16	106
89	49	96	54	93	53	93	34	86	27	65	12	74	6	102
....	47	....	58	....	53	....	38	....	23	70	16	67	13	....
86	48	90	64	85	64	....	....	....	....	....	....	....	....	....
93	43	94	60	93	57	93	40	85	30	76	19	73	25	85
....	....	89	58	89	58	89	38	82	28	74	21	72	23	....
....	....	89	56	87	54	88	38	84	27	76	21	74	23	....
88	47	92	62	89	59	86	40	74	27	70	15	66	15	84
93	43	96	55	96	52	93	38	84	27	78	16	71	16	89
87	56	90	65	89	64	92	47	89	27	78	22	75	29	71
88	43	90	61	89	57	88	40	74	29	73	15	68	22	84
93	44	92	59	91	54	90	42	81	31	76	17	71	24	87
d99	d52	97	62	....	....	....	....	....	....	....	....	....	....	....
92	51	93	63	....	....	....	....	....	....	....	....	....	....	....
85	40	....	....	....	....	86	43	76	30	72	19	67	22	....
87	46	90	62	89	53	89	40	76	28	71	17	67	17	82
....	....	....	....	100	54	101	36	86	27	65	18	72	17	....
91	43	93	58	96	51	98	36	80	25	71	14	70	17	92
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
90	42	94	59	e90	e53	e88	e39	77	24	72	10	e65	e22	91
94	38	95	50	94	43	97	37	....	....	f85	f17	89	17	....
97	42	98	59	89	54	85	44	79	26	d65	20	68	20	93
92	41	94	55	95	50	92	36	82	29	75	16	68	19	89
86	48	90	63	88	59	87	40	79	30	74	25	76	23	82
....	....	d92	d55	e90	e52	h92	h37	84	23	....	....	71	32	....
88	60	90	75	88	72	....	....	83	46	83	34	....	....	....
94	45	97	65	95	62	96	48	93	37	84	30	....	....	....
92	60	94	62	92	63	93	46	90	35	84	24	82	25	70
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
90	....	....	....	95	....	....	....	....	....	84	32	....	....	....
92	42	98	68	96	60	96	44	92	32	86	24	....	....	....
101	53	102	68	101	64	104	49	100	38	88	28	84	34	81
98	57	99	55	94	54	93	50	86	39	83	24	g77	g30	78
95	50	95	53	93	54	....	....	91	39	....	....	....	....	....
96	50	98	68	96	60	92	50	88	35	83	24	79	30	....
92	51	93	71	90	66	92	52	85	36	78	30	81	33	66
....	52	....	....	91	64	92	52	87	39	84	27	79	30	....
95	56	96	69	93	66	93	53	86	41	e84	c34	78	29	67
93	47	94	66	94	61	93	49	89	35	79	26	e79	e32	68
94	45	96	66	93	62	95	51	....	....	....	....	....	....	....
92	56	95	70	....	....	h91	h50	90	34	82	28	77	35	....
90	50	93	72	92	65	92	52	86	40	83	30	79	34	63
....	....	97	68	94	64	94	48	87	38	84	26	79	28	....
93	51	94	70	90	67	92	52	87	41	82	30	80	31	64
93	63	92	71	93	70	94	58	....	....	85	33	77	32	....
87	56	90	69	91	66	93	58	88	37	89	31	87	31	....
97	53	98	70	....	....	....	....	....	....	....	....	....	....	....
95	33	97	70	92	66	93	50	87	38	85	30	79	32	....
100	55	100	68	97	58	96	48	88	44	82	25	80	30	75
98	50	....	....	97	62	....	....	....	....	....	....	....	....	....
96	47	98	68	100	59	98	47	95	32	82	25	82	30	78

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°
Louisiana—Continued.										
Luling	73	29	75	30	79	36	86	41	91	45
Mandeville	70	29	73	29	78	33	89	41	92	44
Marksville	70	29	72	32	80	38	90	48	90	52
Maurepas	76	32	....	....	79	37	86	40	90	46
Melville	....	....	73	30	80	36	89	45	92	45
Minden	74	22	86	22	88	31	....	....	90	46
Monroe	68	27	80	25	80	33	86	47	90	44
Natchitoches	....	....	....	....	....	....	....	....	90	40
New Iberia	78	32	74	34	82	41	88	53	92	51
New Orleans	75	34	76	32	79	44	88	54	90	54
Plaquemine	73	24	76	26	82	34	90	40	93	45
Pointe à la Hache	....	....	....	....	....	....	....	....	....	62
Port Eads	71	31	80	49	74	43	81	58	84	59
Rayville	78	24	79	21	83	29	....	....	....	....
Shell Beach	65	30	70	40	74	48	82	61	88	59
Shreveport	69	25	81	27	83	39	87	52	88	50
Sugar Exp't Station	71	34	75	31	80	40	86	52	91	48
Trinity	70	28	....	....	....	....	90	48	90	....
Vidalia	76	26	76	24	85	32	93	41	94	46
Winnfield	....	....	....	....	....	....	....	....	....	....
Maine:										
Bar Harbor	51	2	43	−9	55	13	66	28	81	38
Belfast	49	4	40	−9	55	20	66	32	81	44
Calais	50	−4	44	−18	57	11	68	24	89	36
Cornish	51	2	43	−14	57	14	75	27	91	40
Eastport	48	−2	45	−12	54	15	63	26	70	37
Fairfield	52	−13	42	−37	56	−2	72	21	91	32
Gardiner	53	3	45	−16	60	8	74	18	93	35
Kennebec Arsenal	....	....	....	....	60	5	76	5†	90	....
Kent's Hill	51	0	38	−17	55	10	72	23	87	37
Lewiston	48	−3	41	−23	56	4	69	26	89	34
Mayfield	....	....	....	....	54	1	69	19	89	34
Orono	52	−2	45	−20	57	4	70	23	89	37
Petit Menan	43	2	40	−5	50	18	62	30	72	40
Portland	52	6	42	−8	60	16	66	26	92	37
West Jonesport	....	....	....	....	....	....	60	28	68	40
Maryland:										
Baltimore	60	20	48	3	68	28	80	34	93	43
Barren Creek Springs	62	22	54	11	68	25	78	34	89	42
Cumberland (1)	58	10	54	0	68	24	80	28	90	34
Cumberland (2)	....	....	....	....	....	....	....	....	....	....
Fallston	59	20	45	1	65	26	....	....	90	40
Fort McHenry	58	23	47	3	63	29	78	34	90	44
Frederick	66	17	50	4	69	28	84	36	91	38
Gaithersburgh	52	18	....	5	....	25	....	31	88	37
Galena	57	25	40	6	....	32	....	41	....	50
Gambrill's	....	....	....	....	....	....	....	....	....	....
Jewell	59	25	....	6	65	31	....	42	....	50
McDonogh	62	18	43	1	63	26	77	33	87	42
Mount St. Mary's	68	16	44	−1	64	27	80	33	92	35
Woodstock College	64	12	....	....	67	22	78	29	88	36
Massachusetts:										
Amherst (1)	61	4	45	−5	65	17	80	26	88	30
Amherst (2)	58	0	42	−9	64	14	78	25	90	30
Amherst (3)	....	....	....	....	61	23	78	30	88	38
Beverly Farm	51	0	....	....	57	17	....	....	....	....
Blue Hill (base)	59	5	47	−4	64	18	78	28	90	35
Blue Hill (valley)	57	7	47	−4	65	16	80	24	92	34

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
[a]91	[a]45	....	....	92	63	94	47	87	37	84	25	[d]82	[d]24	....
94	48	98	68	97	66	96	49	88	41	83	30	77	29	69
93	47	96	54	95	53	[d]94	[d]40	90	40	87	28	80	30	68
93	49	97	69	92	65	93	50	86	39	83	28	80	28	....
94	52	96	68	93	55	95	54	87	40	86	29	82	27	....
92	52	99	69	94	63	91	54	89	36	79	28	[f]75	[f]35	....
94	46	96	68	94	62	92	48	84	36	74	28	74	30	71
96	52	98	66	98	58	96	54	88	38	78	24	....	....	....
90	56	95	71	....	....	[m]95	[m]53	95	39	89	32	90	34	....
92	58	95	71	92	70	94	58	90	50	82	38	80	39	63
95	48	96	64	96	62	97	54	89	31	85	25	81	23	74
....	68	....	72	....	71	....	65	....	52	....	39	....	39	....
89	61	92	71	89	71	90	62	88	53	84	40	77	40	61
[b]92	[i]65	....	....	....	....	....	....	....	....	....	....	....	....	....
90	62	93	74	88	67	89	61	85	54	79	40	76	42	63
93	55	96	70	95	65	92	55	86	39	77	29	78	34	71
96	57	95	68	90	66	94	51	90	42	82	30	....	....	....
91	55	95	71	91	65	90	55	89	39	88	26	80	30	....
98	52	100	66	100	64	100	48	96	37	88	28	82	31	76
[e]89	[e]66	92	74	90	64	89	57	86	39	....	....	....	....	....
87	45	82	52	80	45	84	37	64	30	60	18	51	2	96
82	54	78	58	80	55	77	45	61	30	59	23	50	2	91
88	41	84	48	84	42	84	28	65	21	....	....	....	....	....
87	47	88	54	84	50	83	36	66	17	56	12	53	— 1	105
81	44	76	50	76	50	83	37	58	29	57	19	49	1	95
86	38	86	44	83	42	83	30	65	14	58	12	46	— 9	128
....	....	82	50	84	48	82	37	65	20	62	18	56	1	....
88	....	84	48	81	40	82	37	62	19	59	15	49	— 1	....
[d]84	[d]49	81	51	82	47	81	35	66	23	59	16	[h]42	— 5	94
92	46	82	52	84	48	84	34	66	18	58	17	47	— 2	115
83	41	83	44	80	44	83	28	58	13	55	10	....	....	....
86	42	83	48	83	43	84	32	64	17	59	19	50	— 2	109
....	....	79	50	75	51	71	40	61	39	55	21	46	6	....
84	46	80	52	81	47	76	40	68	26	60	20	60	4	100
78	44	80	52	80	42	78	36	....	....	56	20	48	2	....
91	52	93	61	90	58	84	46	82	34	70	28	73	23	90
89	49	89	57	89	57	87	40	85	35	73	23	73	15	78
84	45	88	54	86	50	84	40	78	24	66	26	66	18	90
84	49	....	....	....	....	....	....	80	28	76	20	75	22	....
....	....	89	56	....	....	80	43	80	31	64	26	68	21	....
90	50	88	60	87	53	82	44	75	32	70	25	69	21	87
89	50	92	58	88	55	84	42	79	31	70	27	72	22	88
....	53	....	62	....	60	....	48	....	30	....	24	....	20	....
....	58	....	68	....	63	....	52	....	36	....	29	....	24	....
....	....	92	64	....	58	....	49	....	32	....	32	....	28	....
....	58	....	68	....	65	....	49	....	37	....	30	....	27	....
87	52	89	59	84	56	81	44	76	31	66	25	67	19	88
....	....	....	....	....	....	85	38	76	24	65	18	67	11	....
90	45	93	55	....	52	....	....	76	30	67	25	68	19	....
87	39	86	43	83	42	82	32	69	23	62	15	62	3	93
88	38	86	46	84	40	82	34	70	21	62	14	64	4	99
90	46	84	54	82	45	79	40	70	21	67	16	64	4	....
....	....	....	....	79	49	74	39	....	....	....	....	....	....	....
83	45	83	49	80	46	80	39	72	26	65	18	64	10	94
87	41	86	48	83	44	84	34	74	25	66	14	65	11	96

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.
Massachusetts—Continued.	°	°	°	°	°	°	°	°	°	°
Blue Hill (summit)	56	4	45	— 6	61	16	76	28	89	37
Boston	60	9	50	— 1	64	22	81	32	91	41
Brewster	55	12	48	5	....	....	....	....	80	40
Cambridge (1)	58	7	47	— 1	61	20	77	28	88	40
Cambridge (2)	57	6	45	— 4	60	22	77	28	89	39
Chestnut Hill	58	6	47	— 4	64	19	80	28	92	37
Cotuit	50	13	43	— 2	56	20	64	26	78	36
Deerfield (1)	56	— 1	45	—14	63	16	79	24	90	40
Deerfield (2)	55	— 2	46	—13	62	14	81	31	90	31
Dudley	56	2	46	— 9	66	15	80	27	92	33
Fall River (1)	55	10	45	— 2	58	18	74	33	83	40
Fall River (2)	55	7	....	....	62	20	74	25	....	....
Fitchburg (1)	55	2	48	— 9	59	20	75	31	90	40
Fitchburg (2)	55	3	49	—10	64	17	81	24	93	34
Fort Warren	57	9	52	— 1	64	11	74	31	89	41
Framingham	58	5	48	— 5	62	18	79	26	93	36
Gilbertville	56	4	39	— 7	59	7	78	25	88	32
Groton	58	4	50	—10	62	16	80	26	91	32
Heath	52	— 2	54	—20	64	10	80	24	89	32
Holyoke	56	8	49	— 4	69	20	82	30	94	36
Lake Cochituate	58	2	50	— 8	66	14	83	20	97	29
Lawrence	56	7	47	— 7	64	15	78	27	96	39
Leicester	54	1	40	— 9	58	15	76	27	89	32
Long Plain	52	8	43	0	56	21	68	28	80	40
Lowell (1)	56	6	49	— 7	61	16	70	27	90	36
Lowell (2)	56	4	46	— 6	64	16	80	25	95	34
Lowell (3)	....	....	....	....	67	7	84	17	94	31
Ludlow	56	2	42	— 8	63	13	77	20	85	40
Lynn	55	7	44	— 1	60	19	70	29	88	32
Mansfield	54	6	45	— 7	63	20	74	25	88	32
Middleborough	55	8	47	— 4	63	17	73	23	86	32
Milton	58	8	48	— 1	64	23	76	28	88	35
Monson	....	....	....	....	65	11	79	23	92	29
Nahant	....	....	....	....	....	....	....	....	....	....
Nantucket	54	16	48	4	52	26	62	32	69	40
New Bedford (1)	52	8	42	— 4	57	19	66	30	74	44
New Bedford (2)	52	6	44	— 5	61	13	67	27	76	38
New Bedford (3)	....	....	46	— 3	57	22	66	30	78	38
Newburyport	58	7	48	— 4	64	21	76	30	92	38
Northampton	55	6	41	— 9	64	20	79	29	90	36
North Billerica	59	1	53	— 6	64	15	82	26	95	35
Plymouth	56	14	52	0	65	27	76	35	88	46
Princeton	54	0	40	—12	60	15	76	25	90	30
Provincetown	54	17	44	3	59	21	....	....	....	....
Rowe	52	— 3	41	—22	54	10	76	24	....	....
Royalston	58	10	48	— 6	58	24	80	36	86	40
Salem	52	8	42	— 1	....	....	76	33	90	41
Somerset	58	6	50	— 6	60	20	78	28	86	39
South Hingham	....	7	....	— 6	....	....	....	16	....	32
Springfield Armory	58	6	42	— 2	62	20	78	30	91	37
Swampscott	....	....	....	....	....	....	....	....	....	....
Taunton (1)	58	8	47	— 2	66	20	80	30	87	37
Taunton (2)	58	7	48	— 4	65	19	76	28	85	35
Taunton (3)	58	8	47	— 4	65	14	77	22	86	32
Vineyard Haven	58	13	53	— 2	58	22	71	32	81	42
Wellesley	56	4	45	— 6	60	16	73	26	90	38
Westborough	58	6	58	— 5	63	18	83	24	98	36
Williamstown	53	4	41	—14	57	13	75	26	85	31

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
84	45	83	50	80	50	80	38	71	28	63	16	62	8	95
87	50	86	55	84	52	83	43	74	32	66	21	65	10	92
87	50	88	51	83	52	82	43	68	36	64	20	58	21	....
86	45	88	52	85	47	84	42	70	27	66	20	61	9	89
84	46	84	53	82	47	82	41	72	27	65	20	61	9	93
88	45	89	50	86	46	85	38	75	27	66	17	64	8	96
84	48	82	54	82	56	79	41	68	32	60	20	56	22	86
90	52	89	57	87	51	84	37	70	18	62	14	62	8	103
91	43	86	49	87	47	84	41	73	28	60	14	66	7	101
85	47	84	55	80	50	80	42	70	32	60	21	60	14	87
....	....	86	52	81	52	82	41	71	30	64	19	61	11	....
88	50	86	53	84	50	82	40	70	27	61	16	60	6	99
86	39	84	50	84	42	82	35	71	25	64	16	62	5	103
86	50	85	52	79	50	81	43	70	32	64	20	60	12	90
90	45	88	50	84	45	83	37	72	26	65	17	64	6	98
89	41	86	45	82	44	83	32	67	16	62	11	58	− 1	96
88	41	86	52	83	43	84	37	71	23	65	15	61	3	101
92	44	92	50	92	48	86	32	70	20	64	12	56	− 4	112
94	46	90	52	88	44	88	40	74	27	62	16	68	6	98
94	40	89	44	87	41	86	32	75	18	65	8	67	1	105
91	44	93	52	88	46	86	40	70	27	65	16	61	6	103
89	43	88	49	80	48	78	36	67	26	60	15	58	3	98
86	51	84	58	80	56	80	42	70	30	64	17	62	16	86
88	44	86	53	82	45	82	40	69	26	64	19	60	6	97
90	42	88	51	86	44	84	37	73	24	66	16	64	4	101
90	45	88	54	87	47	85	40	70	29	66	19	64	7	....
90	34	86	42	85	41	82	30	69	20	68	13	67	2	98
81	48	80	52	80	49	79	41	66	29	62	20	60	10	89
89	46	85	49	82	46	81	35	69	26	55	15	62	9	96
87	43	86	46	81	44	81	35	71	24	67	13	63	11	91
88	48	86	52	84	50	81	40	68	27	63	20	61	12	89
89	41	87	43	82	41	83	35	70	16	63	11	63	− 3	....
....	....	82	53	79	53	79	42	s66	s34	60	23	58	12	....
76	52	79	57	80	59	76	50	68	41	60	28	54	24	76
82	47	83	53	80	53	78	41	67	30	62	18	56	13	87
82	52	83	52	81	51	78	41	68	32	63	19	58	13	88
84	48	86	52	....	....	79	39	....	....	....	....	58	14	....
86	46	86	52	83	49	84	40	73	30	66	19	63	8	96
92	45	90	51	89	50	89	40	68	24	61	18	60	6	101
94	41	91	50	85	46	84	38	72	25	66	18	64	7	101
88	54	84	58	83	60	82	44	71	37	64	21	62	21	88
87	40	83	46	83	44	80	33	67	25	60	11	59	0	102
85	51	84	54	82	52	81	41	67	34	61	28	....	....	....
92	52	88	58	84	58	86	50	70	30	60	24	60	10	98
86	51	84	57	83	53	84	45	71	33	60	18	62	10	....
96	50	94	42	90	52	87	36	74	28	66	18	62	14	102
....	38	....	47	....	41	....	....	....	....	....	12	....	8	....
89	48	88	53	83	48	82	40	70	25	62	20	61	4	93
....	....	82	53	80	53	77	37	68	31	....	....	....	....	....
91	45	89	51	87	51	86	39	74	27	65	19	67	12	93
92	45	87	48	84	48	83	38	70	25	65	13	65	11	96
90	41	86	46	85	44	83	34	71	25	66	14	65	10	94
88	50	85	56	84	58	82	38	69	37	67	24	62	21	90
91	48	89	49	84	42	82	36	71	25	65	14	64	7	97
94	45	94	49	90	48	88	37	71	24	66	17	61	7	103
84	40	82	49	79	46	79	37	67	18	64	17	60	3	99

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Massachusetts—Continued.	°	°	°	°	°	°	°	°	°	°
Wood's Holl	56	14	46	2	52	25	60	34	72	40
Worcester (1)	57	5	44	— 7	62	19	83	30	91	37
Worcester (2)	61	6	45	— 4	62	18	79	31	91	37
Michigan:										
Adrian	53	— 5	40	—12	68	16	78	21	90	25
Albion	51	6	44	— 5	60	18	....	....	[b]85	[b]35
Alma	50	0	48	—24	66	12	75	20	90	21
Alpena	46	4	36	—14	56	12	68	21	91	26
Ann Arbor	....	....	....	....	....	....	....	....	87	33
Atlantic	38	— 2	50	—24	54	2	70	12	86	30
Bear Lake	45	2	42	—10	59	5	69	19	80	28
Bell Branch	40	6	40	—10	56	18	69	22	78	30
Benton Harbor	50	12	41	— 8	67	24	72	30	[b]90	[b]38
Benzonia	45	8	36	—12	61	11	73	21	83	30
Berlin	55	1	43	—22	68	10	....	....	90	30
Berrien Springs	....	....	45	—16	68	18	80	25	95	32
Big Rapids	50	3	45	—27	63	10	72	19	86	27
Birmingham	50	— 7	45	—18	63	13	78	21	91	31
Bronson	52	8	46	— 8	60	15	68	22	....	....
Buchanan	53	3	44	— 9	63	19	72	21	85	32
Calumet	40	— 1	46	—23	54	7	63	14	80	29
Cassopolis	52	6	45	— 8	66	20	75	20	89	34
Charlevoix	....	....	37	—10	60	11	70	22	86	30
Chase	48	— 2	46	—32	62	10	....	....	84	24
Chelsea	50	7	49	— 9	65	13	74	20	88	34
Colon	49	8	42	— 6	60	15	68	20	....	....
Columbia	50	12	48	— 6	48	15	....	....	....	....
Concord	49	8	50	— 7	64	10	78	20	89	29
Deer Lake	46	— 4	38	—26	58	16	78	20	84	30
Detroit	49	7	49	— 8	65	17	76	22	88	34
East Saginaw	50	7	43	—18	69	15	76	21	....	....
East Tawas	46	4	39	—17	57	11	67	11	84	30
Eden	50	5	46	—15	69	9	76	17	91	30
Escanaba	42	0	41	—22	52	15	66	21	76	30
Evart	....	....	....	....	....	....	77	16	87	22
Flint	49	— 4	44	—22	69	11	75	20	90	26
Fort Brady	44	—13	34	—23	55	5	65	12	[m]85	28
Fort Mackinac	40	3	34	—18	50	8	63	11	76	29
Fort Wayne	....	— 2	45	— 7	65	13	76	20	89	31
Fremont	48	7	37	—12	55	20	....	....	80	34
Gaylord	....	....	....	....	56	2	....	....	....	....
Gladwin	45	—11	46	—32	71	9	82	15	93	21
Grand Haven	53	11	41	—10	69	17	73	22	81	32
Grand Rapids	48	9	47	—13	67	15	73	20	89	33
Grayling	....	....	....	....	....	....	74	12	90	25
Gulliver Lake	41	— 7	36	—20	53	5	63	14	93	23
Hanover	51	6	50	— 8	62	10	75	18	88	30
Harrisville	45	5	39	—23	56	9	71	19	87	25
Hart	51	5	47	—20	68	10	74	20	87	24
Hastings	53	9	45	—12	64	16	73	20	87	29
Highland Station	48	4	46	—15	70	20	76	20	92	33
Hillman	47	— 2	48	—17	66	9	75	17	92	23
Hillsdale	....	....	44	—10	62	13	....	....	90	30
Hudson	52	— 5	48	—10	67	7	89	15	90	29
Ionia	50	2	40	—16	64	15	72	20	90	29
Ivan	....	....	....	....	....	....	....	....	88	30
Jeddo	44	5	42	—14	60	19	76	25	....	....
Kalamazoo	52	5	46	—11	65	18	74	20	88	31

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
77	50	79	56	78	56	76	48	65	35	62	25	54	21	77
88	50	85	55	83	52	82	40	70	27	62	17	62	5	98
85	46	87	54	82	48	81	38	70	26	64	19	62	6	95
86	39	92	47	94	44	89	28	80	18	60	13	64	11	166
84	44	90	53	89	50	86	32	73	26	57	14	60	20	....
87	36	92	40	92	40	92	25	75	15	56	5	60	8	116
84	41	91	46	89	42	84	32	62	20	58	14	52	10	105
93	40	91	52	88	49	85	34	74	26	58	14	62	16	....
90	38	92	50	90	48	90	31	....	....	58	12	56	6	....
86	34	90	43	89	37	88	29	58	15	58	2	52	6	100
78	40	84	50	....	....	88	34	64	23	58	12	53	16	....
....	....	....	....	....	....	91	34	76	27	62	21	65	22	....
83	36	87	45	....	....	....	....	....	....	....	....	....	....	....
92	45	98	52	94	46	....	....	73	22	59	13	63	9	....
89	45	96	56	93	50	90	39	74	27	56	18	63	18	....
86	35	91	45	90	38	88	26	71	16	56	0	56	11	118
86	39	94	46	92	43	91	31	72	20	61	13	63	16	112
82	42	....	....	....	....	....	....	....	....	58	14	62	16	....
83	40	88	54	89	48	89	38	72	29	56	10	62	17	98
84	37	87	45	85	45	82	37	62	22	55	12	39	8	88
85	43	92	42	89	49	89	34	73	28	58	18	62	21	100
83	38	92	....	88	45	88	35	62	21	55	17	52	10	....
87	32	90	42	91	32	88	31	72	18	57	-4	55	8	....
86	40	90	48	89	45	....	....	76	21	61	14	63	18	....
80	42	....	....	....	....	....	....	....	....	58	14	62	18	....
....	....	....	....	93	50	90	40	....	....	....	....	....	....	....
89	39	92	50	92	45	89	30	77	23	58	14	63	14	99
88	34	92	50	98	34	86	30	62	16	58	10	65	14	102
86	42	91	53	90	52	85	36	76	25	64	16	65	19	99
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
83	29	....	....	....	....	91	32	64	24	57	10	54	9	....
85	40	91	52	90	42	....	....	....	....	....	....	62	15	....
84	40	85	44	86	38	82	30	60	20	55	8	47	6	108
94	32	95	53	87	33	86	20	73	22	54	12	54	2	....
90	38	93	45	92	42	92	27	72	17	58	8	63	12	115
86	36	87	43	84	39	80	31	58	20	53	10	42	-1	110
75	36	82	48	77	45	75	36	61	25	51	14	62	13	100
86	40	94	47	92	46	89	32	77	17	61	14	65	19	101
82	43	82	57	....	....	....	....	65	22	58	14	56	16	....
....	....	89	38	93	33	....	....	....	....	58	6	44	2	....
....	....	....	....	....	....	90	21	75	12	65	-3	[b]53	[b]3	....
85	40	86	50	91	46	88	30	64	24	55	18	55	16	101
82	35	88	50	88	42	86	31	71	25	53	11	60	16	102
90	35	95	35	90	31	89	25	64	10	60	4	50	-2	....
....	....	85	42	82	38	....	....	58	18	50	11	....	....	....
82	42	90	51	88	47	88	32	73	24	62	14	62	16	98
84	40	95	48	88	37	84	25	62	14	58	11	56	10	118
90	33	95	55	91	50	90	20	65	15	60	2	55	15	115
86	40	91	49	90	42	86	30	73	22	56	12	61	31	103
89	40	98	58	96	50	95	36	60	26	58	14	61	15	113
89	38	95	38	95	37	[f]94	[f]27	[g]68	[g]10	64	-3	56	-2	112
85	44	89	50	87	38	86	35	76	23	56	17	61	18	....
86	37	92	45	89	39	85	25	76	16	58	9	63	10	102
....	....	95	48	93	42	90	38	....	....	....	....	61	3	....
90	34	93	43	94	40	88	32	63	16	56	8	50	5	....
88	48	95	60	93	50	94	32	66	25	58	10	60	11	....
85	36	90	53	90	49	87	34	74	26	57	15	63	14	101

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Michigan—Continued.	°	°	°	°	°	°	°	°	°	°
Lansing (1)	51	6	43	—11	65	11	75	20	89	29
Lansing (2)	50	4	42	—15	64	11	74	19	88	31
Lathrop	48	—10	44	—33	58	8	68	18	84	24
Madison	50	0	40	— 8	60	17	68	20	....	....
Manistee	50	5	37	— 9	65	14	73	22	84	33
Marquette	45	3	48	—21	62	8	68	18	82	30
Marshall	50	9	43	— 8	64	13	76	20	91	30
May	45	6	41	—17	49	17	59	23	88	30
Mio	46	— 6	41	—17	58	7	....	....	90	25
Montague	49	9	36	—12	63	16	71	20	81	29
Mottville	53	— 9	49	—10	69	15	76	20	90	25
North Adams	....	....	....	....	....	....	76	12	89	26
North Marshall	50	3	44	—10	63	9	74	18	85	27
Olivet	52	3	45	—14	63	10	73	16	86	28
Otsego	....	....	....	....	....	....	....	....	....	....
Ovid	50	4	41	—18	63	10	74	20	90	28
Paw Paw	54	8	43	—19	65	10	75	15	88	25
Petersburgh	55	6	50	— 8	66	12	78	24	89	29
Pontiac	52	10	44	—10	54	18	73	24	84	35
Port Huron	52	5	41	—13	63	14	74	24	88	30
Pulaski	51	10	48	— 4	46	18	66	22	....	....
Rawsonville	....	....	....	....	....	....	....	....	92	30
Romeo	47	8	40	— 9	....	....	77	21	87	33
Roscommon	46	— 8	44	—33	63	6	73	17	90	25
St. Ignace	....	....	....	....	40	15	65	17	79	27
St. John's	49	8	44	—12	65	14	73	23	89	30
Sand Beach	44	8	37	—17	58	12	62	22	79	30
Saulte de Ste. Marie	42	—13	32	—19	55	8	64	10	84	29
Standish	....	....	....	....	....	....	80	22	91	29
Stanton	....	....	49	—20	66	12	72	20	87	27
Thornville	49	— 6	44	—23	53	21	76	22	90	34
Traverse City (1)	46	1	40	—22	58	11	75	21	91	27
Traverse City (2)	47	5	40	—22	63	12	72	20	85	26
Vandalia	46	2	42	—10	54	15	68	20	....	....
Washington	50	— 8	46	—19	64	14	75	19	86	31
West Branch	44	— 4	....	....	57	11	....	....	88	28
Williamston	52	7	44	—12	67	16	72	22	86	34
Ypsilanti (1)	48	— 4	42	— 8	69	9	76	20	90	28
Ypsilanti (2)	53	4	41	—11	66	16	78	20	88	32
Minnesota:										
Brainerd	....	....	....	....	62	2	71	26	82	35
Crookston	....	....	....	....	....	....	....	....	....	....
Duluth	45	—13	53	—30	64	1	70	22	78	32
Farmington	40	—10	46	—26	66	18	78	26	82	32
Fort Snelling	43	—11	37	—29	68	13	81	25	85	29
Grand Meadow	41	— 8	47	—30	69	16	80	28	87	31
Lake Winnibigoshish Dam	39	—28	52	—40	64	— 6	70	21	....	....
Leech Lake Dam	40	....	50	....	64	— 6	....	....	....	....
La Sueur	39	—10	47	—26	[c]66	[c]12	[d]74	[d]28	[d]83	[d]40
Mankato	44	— 8	50	—25	68	17	76	26	87	34
Medford	48	—14	46	—34	66	12	84	20	85	26
Minneapolis	40	—12	47	—26	63	17	74	28	81	38
Montevideo	....	....	....	....	....	....	....	....	....	....
Moorhead	46	—29	39	—35	68	— 2	82	20	87	20
Morris	40	—30	39	—36	70	8	76	23	88	29
Northfield	41	— 8	48	—27	66	13	78	23	84	30
Owatonna	....	....	....	....	....	....	....	....	....	....

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		Range.
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
87	40	93	49	93	45	90	29	74	21	57	13	62	15	104
84	40	90	48	91	45	89	28	73	19	57	13	62	17	106
90	33	102	40	88	33	86	28	64	16	56	2	46	-8	135
....	....	98	48	93	46	89	31	79	21	59	12	62	13	....
83	37	86	50	86	44	87	33	59	22	51	16	57	15	91
87	38	88	45	88	45	84	34	67	24	66	14	46	6	109
89	41	94	49	93	45	93	28	76	21	53	12	62	13	102
80	40	78	50	....	....	e88	e21	68	23	....	....	58	16	....
87	33	92	41	90	37	....	....	60	11	55	1	52	2	....
82	38	84	47	88	44	90	29	65	19	59	17	51	13	102
84	40	89	49	91	44	92	25	79	19	58	12	64	11	102
89	41	92	36	93	44	89	29	76	21	58	12	....	....	....
88	35	89	42	90	42	90	30	75	20	57	10	61	11	100
90	38	87	41	90	40	90	33	73	20	56	11	60	13	104
....	....	....	....	91	45	88	32	73	20	55	12	58	17	....
84	40	93	48	89	43	88	27	70	19	58	10	60	11	111
85	36	91	48	94	43	91	29	75	20	55	16	63	16	113
85	40	92	47	....	....	....	....	....	....	....	....	....	....	....
80	42	86	53	84	53	84	38	68	27	56	15	60	18	96
84	42	91	45	89	46	87	32	68	26	60	13	62	12	104
80	40	....	....	90	48	....	....	60	27	58	14	58	20	....
82	42	96	50	90	44	88	32	73	22	60	17	62	18	....
....	....	....	....	....	....	90	33	72	23	59	12	62	13	....
92	34	96	37	90	32	86	26	64	8	54	3	52	5	129
....	40	....	46	84	37	78	32	58	19	....	....	44	5	....
84	42	92	51	92	45	90	32	71	21	60	14	61	14	104
84	41	91	50	88	49	84	38	65	27	....	....	55	8	....
85	38	88	45	84	43	80	34	57	21	49	13	42	3	107
89	37	96	44	93	39	89	38	67	14	58	10	54	9	....
85	38	89	47	93	42	88	26	71	21	53	6	59	16	....
86	44	92	50	90	49	92	35	69	20	60	11	61	19	115
89	38	95	43	94	42	90	33	64	16	55	15	54	6	117
84	32	93	34	89	43	89	34	59	20	57	15	53	8	115
80	42	....	....	90	48	....	....	....	....	52	19	60	17	....
83	38	90	47	89	48	89	33	71	18	59	11	62	15	109
87	39	91	44	87	40	85	29	64	23	55	10	52	9	....
80	46	88	55	90	47	86	36	74	22	60	30	60	20	102
86	39	92	49	91	42	89	29	75	16	55	13	59	12	100
81	42	91	52	90	44	85	34	77	24	66	17	62	17	102
99	50	98	56	97	53	83	33	78	19	....	....	....	....	....
....	....	95	51	94	46	92	30	70	18	52	-7	40	-9	....
80	43	84	50	86	48	76	36	70	25	60	1	43	-6	116
90	48	100	52	88	52	82	34	76	24	52	0	44	-2	126
91	37	100	48	99	45	90	29	78	20	60	-7	48	-6	129
96	40	98	52	99	54	93	30	75	20	58	-4	58	1	129
91	46	89	53	87	52	86	34	70	23	55	-10	37	-17	....
73	29	90	39	90	37	88	26	73	18	56	-18	40	-18	....
90	45	d95	54	d94	d50	83	33	77	25	d57	-11d	50	-10	121
88	38	95	49	91	45	90	32	78	21	53	-5	50	1	120
90	31	92	43	94	40	....	....	....	....	....	....	....	....	....
90	45	99	56	93	55	91	37	75	25	54	-5	44	-8	125
....	....	....	....	100	52	92	32	80	21	64	-5	47	-14	....
90	35	93	39	96	38	94	29	78	18	59	-5	41	-8	131
89	43	90	45	94	46	89	30	76	22	61	-8	44	-17	130
....	37	....	50	91	45	89	30	77	18	53	-7	47	0	....
....	....	95	44	92	42	88	26	80	17	53	-12	50	-3	....

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°
Minnesota—Continued.										
Pine River	43	—34	46	—44	60	— 4	68	18	79	30
Pokegama Falls	47	—33	50	....	65	— 8	72	13	75	17
Red Wing	46	— 6	48	—25	65	19	78	27	83	33
Rolling Green	38	—15	42	—24	65	17	75	28	81	31
St. Charles	....	....	....	....	....	....	....	....	....	....
St. Paul	42	—10	50	—25	67	13	76	26	84	33
St. Vincent	48	—36	38	—43	69	— 9	83	9	80	22
Mississippi:										
Aberdeen	....	....	....	....	....	....	....	....	90	33
Agricultural College	65	22	....	....	81	30	85	37	91	40
Batesville	68	21	76	15	80	33	85	37	92	39
Booneville	....	....	....	....	....	....	83	34	90	43
Brookhaven	....	....	....	....	....	....	....	....	....	....
Canton	....	28	....	24	....	....	....	46	....	48
Columbus	....	....	....	....	....	....	....	....	99	41
Corinth	....	....	....	....	....	....	....	....	[f]93	[f]32
Edwards	....	....	78	23	78	32	....	....	93	45
Fayette	....	....	....	....	....	....	....	....	....	....
Greenville	....	....	81	25	80	30	82	45	87	45
Hazlehurst	....	....	....	....	....	....	....	....	[f]93	[f]43
Hernando	....	....	....	....	....	....	....	....	91	50
Holly Springs (1)	....	....	72	20	....	....	....	....	88	46
Holly Springs (2)	....	....	....	....	....	....	....	....	93	42
Jackson	....	....	....	....	....	....	....	....	96	40
Kosciusko	....	....	....	33	69	....	....	52	89	50
Lake	....	....	....	....	....	....	....	....	91	37
Lamar	66	22	76	20	82	32	....	....	94	43
Loch Leven	68	28	74	30	80	36	88	47	92	47
Logtown	66	32	75	31	79	37	86	45	89	46
Louisville	65	22	[i]81	[i]20	86	28	92	36	94	37
Macon (1)	[e]62	[e]23	....	....	[i]78	[i]28	85	38	90	43
Macon (2)	....	....	....	....	....	....	....	....	96	40
Meridian (1)	....	....	....	....	....	....	....	....	96	41
Meridian (2)	....	....	....	....	....	....	....	....	....	....
Natchez	....	....	....	....	....	....	....	....	94	43
Okolona	....	....	....	....	....	....	....	....	98	40
Palo Alto	64	24	78	19	....	....	....	....	....	....
Pearlington	71	32	75	31	77	41	87	45	88	55
Pontotoc	59	23	65	19	82	27	84	39	92	39
Port Gibson	....	....	....	....	....	....	....	....	[m]90	[m]40
Rienzi	....	....	68	18	[j]77	[j]42	84	46	92	44
Summit	[j]65	[j]24	[e]72	[e]24	[k]79	[k]30	83	39	90	41
University	62	22	75	17	80	29	82	41	93	44
Vicksburg	70	26	79	24	80	36	86	46	92	48
Water Valley	....	....	81	18	82	31	88	43	99	43
Waynesborough (1)	64	24	71	25	80	30	84	37	89	39
Waynesborough (2)	....	....	....	....	....	....	....	....	94	41
Missouri:										
Columbia	....	....	....	....	....	....	....	....	....	....
Conception	53	— 1	....	....	68	22	84	39	84	37
Craig	47	0	58	— 6	70	16	....	....	....	....
Excelsior Springs	48	4	66	— 7	67	14	84	24	90	38
Fayette	56	2	69	— 5	70	20	83	27	88	33
Fox Creek	60	11	72	— 2	74	22	76	28	86	40
Frankford	....	— 2	60	— 4	72	19	....	32	93	33
Glasgow	55	2	73	— 8	70	20	82	28	89	34
Grand Pass	49	4	68	— 5	70	22	83	32	87	36
Harrisonville	48	2	66	— 7	67	20	84	30	88	40

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		Range.
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
89	40	96	55	88	50	88	26	66	10	48	—10	38	—10	140
92	30	90	36	88	34	85	21	74	11	50	—25	44	—29	....
88	41	95	50	91	46	90	32	76	22	52	— 2	49	0	120
89	49	92	56	94	53	86	29	78	21	52	— 2	50	— 6	118
.....	.....	.....	.....	94	53	.....	34	82	20	57	— 1	54	2	....
90	42	96	50	91	49	88	32	76	25	56	— 4	47	— 4	121
92	33	94	41	95	32	94	28	77	9	58	— 5	40	—21	138
94	40	94	62	94	56	90	40	84	28	80	20	.....	.....	....
.....	.....	97	61	94	59	93	44	86	34	79	24	75	32	....
98	46	100	62	96	56	94	44	82	30	80	22	78	22	85
95	43	93	61	.....	.....	.....	.....	.....	.....	[d]73	[d]21	78	25	....
96	42	98	64	98	56	98	42	90	34	84	24	80	26	....
88	49	91	71	.....	66	.....	51	.....	37	.....	.....	.....	28	....
104	43	104	66	105	60	100	44	90	31	80	21	78	22	....
92	36	94	54	94	54	92	44	82	28	78	20	79	24	....
94	48	98	70	94	62	96	48	88	40	84	26	77	28	....
[j]93	[j]62	98	68	94	63	95	49	90	39	87	26	79	30	....
89	48	92	68	92	62	91	49	84	36	81	28	.....	.....	....
96	60	96	64	94	60	98	44	92	36	88	24	.....	.....	....
94	59	[e]96	55	95	57	91	45	88	30	72	26	.....	.....	....
90	50	93	66	92	61	88	50	78	40	74	24	70	32	....
94	48	96	64	94	58	92	46	82	36	70	20	.....	.....	....
96	44	98	66	98	56	96	44	[f]88	36	82	28	76	24	....
93	57	91	66	92	61	93	53	89	33	85	23	78	27	....
95	40	98	64	94	56	94	40	88	30	82	20	76	20	....
91	50	94	70	.....	.....	.....	.....	.....	.....	.....	.....	[h]80	[h]30	....
.....	.....	98	70	95	62	94	50	88	38	84	28	.....	.....	....
93	50	94	70	91	66	94	51	88	41	81	29	77	30	65
98	39	100	66	98	58	102	39	93	30	89	18	82	22	84
91	46	94	56	.....	.....	.....	.....	.....	.....	86	32	.....	.....	....
98	42	100	66	96	58	96	40	88	34	86	30	.....	.....	....
101	45	104	62	[f]99	[f]59	.....	.....	.....	.....	.....	.....	.....	.....	....
.....	.....	.....	.....	.....	.....	93	42	88	32	77	22	76	22	....
97	48	98	64	97	60	97	45	92	34	88	22	.....	.....	....
98	44	98	62	98	58	96	42	86	32	84	20	.....	.....	....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	82	24	77	25	....
93	50	94	73	91	66	94	51	88	41	81	29	77	30	65
91	46	90	61	90	57	90	43	83	33	80	26	79	28	73
93	43	97	67	95	53	96	42	92	32	89	20	.....	.....	....
90	52	93	66	91	63	90	48	85	38	79	26	78	30	....
93	44	93	66	89	62	.....	.....	86	36	[i]78	[i]28	.....	.....	....
90	47	94	64	91	61	92	48	82	38	78	23	74	28	77
92	52	94	69	92	66	94	51	88	39	85	30	79	34	70
97	50	100	66	98	62	98	48	86	34	85	24	79	26	....
94	41	95	55	95	58	92	44	88	35	85	23	75	25	72
94	41	96	66	94	60	94	42	88	34	82	22	.....	.....	....
.....	.....	.....	.....	.....	.....	89	33	83	32	72	12	75	11	....
88	51	90	54	88	54	87	39	84	27	59	4	67	7	....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	72	12	75	2	....
97	40	97	51	95	53	89	32	83	22	65	10	70	8	104
94	41	99	52	.....	.....	89	33	86	28	70	11	72	11	....
90	42	90	60	87	64	.....	.....	70	33	62	16	68	16	....
.....	[d]47	98	46	.....	56	78	21	83	24	61	6	.....	11	....
95	40	99	52	94	51	87	32	85	29	70	10	72	10	107
92	43	94	54	93	53	87	35	84	34	69	12	69	10	90
96	50	97	58	93	56	89	33	92	28	69	12	74	24	104

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°
Missouri—Continued.										
Ironton	69	16	70	4	80	26	84	36	88	44
Jefferson Barracks	58	5	59	—10	74	14	86	48	88	28
Kansas City (1)	52	4	65	—4	71	22	87	33	85	39
Kansas City (2)	54	4	66	—4	74	22	88	32	88	37
Kirksville	50	2	60	—7	72	22	78	30	88	36
Lamonte	60	5	65	—3	73	22	....	....	....	....
Mexico	45	6	70	—6	70	21	78	31	85	42
Miami	55	3	72	—6	75	20	86	32	90	37
New Frankfort	50	4	....	....	64	20	78	34	88	38
New Haven	60	23	69	3	....	....	....	....	....	....
Oak Ridge	58	18	62	9	72	27	79	40	86	32
Oregon	49	0	64	—8	75	18	88	30	90	34
Ozark	55	8	69	0	76	13	....	....	88	26
Princeton	48	1	61	—6	70	25	85	35	90	36
St. Charles	62	11	70	—1	74	23	....	....	87	40
St. Louis (1)	64	13	69	0	76	25	84	30	90	42
St. Louis (2)	63	12	68	—2	75	25	84	30	90	42
Sedalia	58	1	63	—7	75	20	83	34	90	37
Springfield (1)	61	5	67	1	74	20	84	36	89	37
Springfield (2)	60	4	65	1	74	19	82	35	86	37
Steelville	63	12	73	—4	78	16	80	30	90	31
Warrensburgh	50	2	....	....	....	....	87	35	....	....
Willow Springs	....	....	....	....	....	30	91	35	100	31
Wither's Mills	40	....	66	—4	....	....	....	....	....	....
Montana:										
Fort Assinniboine (1)	51	—21	62	—22	70	5	81	23	87	29
Fort Assinniboine (2)	51	—21	60	—29	72	4	81	18	81	26
Fort Custer (1)	48	—12	54	—24	70	12	78	26	85	29
Fort Custer (2)	48	—12	54	—24	70	6	78	26	85	29
Fort Keogh	43	—18	55	—25	72	3	80	21	85	33
Fort Logan	....	....	....	....	....	....	....	....	78	14
Fort Maginnis	59	—15	57	—23	74	5	79	25	86	24
Fort Missoula	44	—21	58	0?	70	23	76	25	89	32
Fort Shaw	56	—22	60	—20	72	3	80	23	82	26
Glendive	....	....	....	....	....	....	....	....	80	28
Helena	48	—14	61	—15	64	4	76	25	80	31
Poplar River, Camp	44	—20	58	—35	73	—7	80	17	80	27
Powder River	....	....	....	....	....	....	....	....	....	34
Sheldon	41	—17	49	—10	62	15	75	28	86	36
Virginia City	43	—8	51	—11	60	15	73	12	79	28
Nebraska:										
Alliance	....	....	....	....	....	....	....	....	....	....
Ansley	52	—5	60	—9	76	7	83	25	95	22
Ashland	46	—3	48	—20	71	11	81	30	93	32
Bingham	....	....	....	....	....	....	....	....	....	....
Brownville	....	....	....	....	....	....	....	....	90	33
Craig	....	....	....	....	....	....	k82	k34	87	40
Creighton	45	—15	55	—27	76	8	87	25	94	26
Crete (1)	52	—5	52	—16	70	15	82	27	89	32
Crete (2)	....	....	52	—16	70	15	82	27	....	....
Culbertson	56	—16	60	—14	78	4	f86	f28	....	....
David City	48	0	....	....	....	14	....	25	86	34
De Soto	44	—4	51	—11	71	17	84	31	93	34
Fairbury	....	0	56	—6	70	....	82	32	89	42
Falls City	46	—4	59	—12	73	17	86	26	92	33
Fort Niobrara	50	—14	59	—16	71	8	83	18	85	20
Fort Robinson	55	1	64	—17	70	8	82	20	89	22
Fort Sidney	55	—4	60	—10	68	0	83	22	88	24

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		Range.
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
90	54	91	62	90	60	90	44	84	30	70	16	76	18	87
93	30	95	53	100	50	92	33	92	28	72	14	75	16	110
89	50	92	60	91	60	89	40	86	32	67	10	70	12	96
94	46	98	56	97	56	93	36	88	28	68	10	70	10	102
94	56	....	52	....	54	....	....	....	....	....	....	70	8	----
95	57	99	62	102	60	98	32	88	40	70	10	75	10	----
94	48	98	60	....	....	....	....	....	....	....	....	....	....	....
98	42	102	56	98	56	94	32	86	34	68	10	70	10	108
92	42	98	60	96	64	86	36	86	32	58	12	70	12	----
....	....	96	60	....	....	88	48	88	40	66	17	73	24	----
88	40	....	....	97	57	90	40	....	....	68	22	69	22	----
89	47	91	56	88	58	92	37	86	32	62	8	73	6	99
95	40	98	46	92	52	87	33	87	27	65	16	73	13	98
98	55	98	65	99	57	86	38	84	31	63	10	66	6	105
....	....	....	....	90	55	84	38	83	32	....	....	....	....	----
93	47	93	61	91	60	90	42	84	35	62	14	73	20	93
92	49	96	60	91	60	90	42	84	36	62	14	73	20	98
96	47	100	56	100	56	94	35	88	30	72	9	74	9	107
91	50	....	....	....	....	....	....	84	32	....	....	....	....	----
90	48	92	56	89	57	86	38	84	32	71	14	74	13	91
90	38	94	51	92	50	89	32	84	23	78	16	76	12	98
90	53	....	....	92	54	84	40	86	32	66	11	78	8	----
100	39	....	53	100	54	93	32	92	29	75	15	78	12	----
....	....	....	....	....	....	....	....	80	32	....	....	70	14	----
98	39	91	41	99	41	87	22	89	21	63	-14	50	-16	121
99	38	91	47	92	42	88	22	88	18	63	-14	47	-14	128
100	36	95	41	100	45	86	30	89	23	64	6	58	-4	124
100	36	95	41	100	45	86	30	89	23	64	6	58	-4	124
104	42	101	46	102	45	87	29	92	18	65	-3	53	-11	129
90	35	88	31	92	32	82	16	80	16	55	-8	44	-7	----
96	36	94	37	96	42	88	24	94	20	67	5	57	-14	119
92	38	96	37	86	36	82	20	81	25	59	0	55	-10	117
95	38	95	35	92	41	90	26	91	20	67	4	50	-12	117
101	33	99	36	98	40	89	31	91	18	64	-14	55	-6	----
89	40	91	39	93	40	80	28	80	30	54	12	47	-9	108
103	38	99	41	102	39	90	27	93	11	63	23	39	-17	138
110	48	106	57	110	50	90	29	96	15	62	-3	55	-4	----
96	50	94	40	86	44	80	32	80	28	48	14	44	2	113
90	34	92	29	91	35	79	28	83	19	52	7	47	-3	103
....	....	....	....	....	....	93	33	91	25	78	0	76	-2	----
104	43	105	43	97	40	91	31	86	11	74	2	70	-1	114
95	43	98	50	93	54	92	33	84	23	58	8	69	7	118
....	....	103	48	93	46	93	28	....	....	62	0	62	....	----
90	46	92	54	90	52	....	....	....	....	....	....	....	....	----
93	56	94	57	89	58	83	36	82	22	60	5	63	2	----
98	42	102	44	97	45	101	32	80	15	58	0	57	0	129
91	43	95	50	89	51	91	34	83	22	62	4	68	2	111
91	43	95	50	....	....	91	34	83	22	62	6	68	2	----
97	49	108	42	....	....	98	30	....	....	....	....	....	....	----
86	52	92	42	88	52	....	....	82	18	60	0	62	8	----
92	40	96	54	93	54	87	33	83	24	56	7	67	6	107
90	....	96	....	90	....	86	....	....	32	57	10	72	7	----
94	48	97	53	93	54	94	34	89	28	51	20	69	4	109
95	32	110	43	105	43	98	26	91	24	64	-12	63	-14	126
96	38	106	40	99	40	97	24	87	24	67	0	66	-1	123
97	39	109	35	106	42	100	25	90	12	65	0	66	-5	119

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.
	°	°	°	°	°	°	°	°	°	°
Nebraska—Continued.										
Franklin	58	— 4	54	— 8	74	8	85	30	90	34
Fremont	46	— 4	49	—20	70	13	79	30	91	37
Genoa	48	— 7	51	—19	68	12	79	29	91	20
Gering	....	....	....	....	....	....	....	....	....	....
Hay Springs	49	— 5	56	—20	67	4	78	19	82	26
Howe	....	....	....	....	....	....	....	....	....	....
Kennedy	....	....	63	—13	75	10	86	24	94	29
Kimball	54	— 3	59	—11	....	....	....	....	86	32
Lexington	....	....	....	....	....	....	88	31	....	....
Lincoln	49	— 4	52	—17	69	9	79	24	....	....
Marquette	50	— 5	53	—10	69	14	85	28	95	32
Minden	48	— 4	54	—16	68	14	84	30	92	40
Nebraska City	49	— 3	56	—12	70	16	83	31	86	32
North Loup	44	— 9	50	—10	68	7	80	27	91	24
North Platte	48	— 9	56	— 6	69	9	84	24	89	25
Omaha	47	— 2	53	—10	71	17	80	32	90	37
Omaha Barracks	....	....	58	— 9	62	11	88	27	94	35
Oakdale	46	—13	56	—26	69	7	84	27	94	25
Palmer	46	— 6	52	—10	70	16	80	28	92	25
Ravenna	46	— 5	54	— 8	67	7	79	27	88	26
Sargent	42	—13	51	—14	68	14	83	29	94	35
Stratton	....	....	....	....	59	25	71	34	....	36
Syracuse	45	2	57	— 8	71	15	81	36	90	40
Tecumseh	45	— 4	48	—15	64	14	76	35	87	32
Valentine	58	—10	66	—15	81	10	82	23	84	23
Weeping Water	46	— 6	53	—12	75	8	84	28	94	29
West Hill	45	—10	50	—21	70	12	82	30	93	40
Weston	....	....	....	....	....	....	83	32	90	40
West Point	45	—10	52	—20	73	....	82	....	82	....
Nevada:										
Austin	40	3	51	6	71	20	....	....	88	23
Battle Mountain	48	— 6	58	— 2	70	30	85	36	90	34
Belmont	....	....	....	....	....	....	....	....	86	21
Beowawe	50	—19	60	— 8	78	30	83	33	95	38
Brown's	48	0	66	4	77	28	88	40	100	46
Candelaria	....	....	....	....	....	....	78	29	89	29
Carlin	35	—24	52	— 7	72	20	84	30	95	30
Carson City (1)	55	— 1	62	1	71	24	77	27	88	29
Carson City (2)	57	— 7	67	— 4	77	20	80	24	91	28
Dayton	56	4	64	10	74	22	88	27	95	31
Downeyville	....	....	....	....	....	....	....	....	95	42
El Dorado Canyon	65	34	75	32	85	47	100	48	106	54
Elko (1)	53	—22	72	—11	84	12	78	28	92	34
Elko (2)	46	—18	55	— 5	62	22	85	21	98	26
Ely	60	—15	65	— 7	68	20	80	24	90	21
Eureka	45	—11	54	— 4	70	15	84	16	94	25
Fenelon	32	— 6	52	— 6	66	32	80	30	96	34
Ferguson's Ranch	....	....	....	....	....	....	....	....	96	30
Fort McDermitt	52	4	62	4	68	25	81	21	91	27
Genoa	53	0	58	8	69	24	....	....	87	30
Golconda	60	—10	75	10	75	25	80	38	92	40
Halleck	44	—20	56	— 8	70	26	90	30	98	32
Hawthorne (1)	54	10	70	8	74	30	84	32	93	36
Hawthorne (2)	....	....	....	....	....	....	....	....	....	....
Hot Springs	60	2	69	10	65	18	85	38	100	42
Humboldt	50	— 3	68	10	70	28	84	36	94	32

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
93	45	....	....	....	....	....	....	....	....	64	-4	68	-3	....
90	50	96	54	91	56	86?	39	78	23	58	7	66	9	116
93	45	99	52	91	52	88	36	83	20	56	1	64	7	118
....	....	101	54	102	48	96	32	84	24	65	6	66	1	....
[i]93	[i]39	104	43	98	43	95	24	84	22	64	-6	[n]64	-3	124
....	....	....	....	....	....	89	32	90	27	56	8	70	0	....
100	42	105	50	103	50	96	36	84	29	68	0	71	6	....
99	37	108	38	105	41	100	25	....	....	....	....	65	0	....
....	....	....	....	....	....	....	....	72	19	63	3	63	10	....
....	....	....	....	....	....	90	36	....	....	60	6	65	4	....
94	52	102	52	97	55	89	38	....	....	....	....	61	7	....
94	54	98	58	96	54	....	....	....	20	68	0	62	2	....
....	....	92	51	....	....	....	....	82	24	64	5	71	5	....
98	38	100	42	95	46	87	31	88	15	58	2	62	0	110
91	42	102	42	96	47	90	31	88	23	62	2	70	6	111
90	44	94	56	92	56	88	38	84	28	60	7	68	10	104
[f]103	[f]42	....	....	[o]90	[o]54	87	35	84	27	60	4	70	5	....
96	40	99	45	96	50	89	29	....	....	60	0	59	0	....
92	48	100	60	92	52	....	....	80	20	62	0	60	10	....
90	41	98	43	93	47	....	....	84	16	65	4	64	4	....
....	....	101	....	100	57	....	....	....	....	....	-3	....	....	....
....	46	....	48	....	....	....	....	....	....	....	....	....	....	....
89	55	95	62	90	58	89	37	84	26	61	9	68	6	103
90	50	[g]94	[g]52	89	61	82	39	81	35	[d]55	[d]9	....	....	....
92	43	106	44	98	46	97	33	86	22	67	-2	66	-5	121
93	44	100	47	94	51	89	31	83	21	63	8	69	1	112
92	55	102	60	92	56	....	....	83	25	60	0	62	5	....
94	49	96	58	96	54	89	37	82	31	65	11	80	5	....
90	....	100	....	92	....	86	....	85	....	71	18	65	....	....
....	....	97	47	95	44	....	....	....	....	....	....	50	-2	....
96	48	102	54	100	54	89	45	80	30	59	23	60	0	108
87	41	96	51	92	49	82	35	78	24	28	9	42	-3	....
94	53	102	65	99	58	90	40	89	28	53	18	54	-9	121
104	48	110	65	100	58	100	45	90	29	71	18	60	2	110
95	46	97	57	95	51	85	37	82	28	58	22	47	4	....
102	56	108	60	102	44	90	30	87	25	56	10	54	-20	132
92	41	100	43	93	40	88	28	85	21	64	16	52	-7	107
94	37	101	40	94	37	92	26	88	22	71	12	54	-11	112
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
98	50	105	52	101	55	92	42	87	36	68	29	59	1	....
110	68	119	69	117	71	110	60	103	47	81	41	70	36	87
101	50	107	56	101	46	85	28	....	....	56	18	52	-14	....
102	34	108	36	103	29	94	13	84	17	61	4	54	-20	128
93	33	99	48	87	34	81	23	79	14	62	9	61	-14	114
99	38	106	44	103	38	89	24	87	19	59	13	50	-4	117
96	50	98	58	98	50	100	38	98	27	60	20	55	-13	113
98	40	104	51	99	41	92	30	87	22	60	11	59	5	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
86	41	98	44	94	41	88	29	85	26	63	18	52	-12	....
94	54	104	67	98	56	92	38	92	30	76	22	62	6	114
104	50	110	59	105	40	91	30	82	26	....	....	....	....	....
102	62	106	66	100	60	90	48	76	36	68	28	60	18	98
97	48	102	55	100	51	92	38	88	29	67	23	....	....	....
90	50	115	60	108	50	95	32	74	27	65	10	60	0	115
94	54	106	58	100	40	90	46	80	28	62	15	55	0	109

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Nevada—Continued.	°	°	°	°	°	°	°	°	°	°
Lewer's Ranch	58	5	63	1	73	20	78	26	89	25
Mill City	....	....	....	....	80	21	90	30	92	39
Montello	38	—10	54	6	70	30	84	35	110	36
Palisade	45	—22	58	0	72	24	92	39	100	30
Pioche	56	— 6	60	— 2	68	18	84	20	90	23
Punch Bowl	....	....	....	....	....	....	....	....	....	....
Reno	52	8	62	8	80	26	76	36	....	....
Reno State University	53	0	....	....	....	....	80	25	90	29
Ruby Hill	....	....	....	....	....	....	69	18	74	20
St. Clair	....	....	....	....	....	....	81	21	....	....
Sodaville	....	....	....	....	....	....	....	....	....	....
Tecoma	45	—10	56	0	72	30	84	38	92	34
Toano	40	— 8	50	2	70	32	78	36	88	36
Tuscarora	42	—10	51	0	62	20	75	20	....	....
Verdi	....	....	....	....	72	20	80	30	89	31
Virginia City	....	....	....	....	....	....	....	....	88	26
Wadsworth	....	....	....	....	....	....	84	33	94	38
Wells	52	—20	57	10	....	....	75	22	101	30
Wellington	49	6	53	4	59	12	73	24	85	20
Winnemucca (1)	49	—14	62	2	70	24	80	21	91	30
Winnemucca (2)	49	—14	69	3	73	28	82	34	91	31
New Hampshire:										
Berlin Falls	60	— 9	....	....	....	....	77	10	96	25
Berlin Mills	60	— 9	48	—28	60	0	82	18	94	29
Concord	56	— 3	50	—14	61	8	79	23	92	33
Hanover (1)	50	— 7	42	—25	53	8	77	21	87	32
Hanover (2)	....	....	....	....	....	....	....	....	....	....
Manchester (1)	60	3	50	— 9	62	14	79	24	94	36
Manchester (2)	56	1	51	— 9	65	16	80	24	95	32
Manchester (3)	55	— 1	48	—12	63	16	78	23	94	32
Nashua	59	1	47	— 8	65	13	82	25	95	33
Newton	....	....	....	....	....	....	76	25	93	32
North Chesterfield	51	— 9	46	—30	56	0	85	15	....	....
North Conway	....	— 3	44	—21	61	8	81	24	94	31
North Sutton	....	....	47	—21	58	12	77	28	....	32
Plymouth	45	— 7	44	—24	59	— 2	85	18	96	29
Shaker Village	52	0	44	—10	55	13	79	25	87	36
Stratford	60	—14	47	—27	63	5	79	19	97	32
Walpole	52	— 4	50	—16	66	11	78	19	88	30
West Milan	54	—12	47	—44	62	— 6	74	12	94	28
New Jersey:										
Allaire	....	....	52	1	64	22	73	25	90	32
Asbury Park	56	16	49	1	64	23	72	28	90	39
Atlantic City	52	19	48	2	60	27	70	32	89	41
Beverly	59	17	50	2	67	25	82	30	92	36
Billingsport L. H.	60	24	46	4	64	29	76	36	85	45
Bridgeton	59	22	51	6	64	32	76	34	90	50
Cape May C. H.	58	21	50	5	66	28	76	32	90	40
Egg Harbor City	58	17	50	1	64	25	77	28	91	35
Freehold	58	16	50	— 2	62	21	76	28	88	34
Gillette	58	9	50	— 2	61	22	80	28	90	38
Hanover	57	9	50	4	62	26	....	....	92	39
Highland Park	59	15	50	0	62	24	77	29	88	36
Imlaystown	57	17	48	0	63	24	....	....	90	36
Jersey City	58	1	48	4	63	26	[c]68	33	[d]86	41
Lambertville	56	18	48	3	63	28	78	33	90	43
Locktown	57	13	44	— 3	62	23	76	27	90	34
Madison	58	12	46	— 1	64	23	79	28	92	35

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
98	36	100	42	93	41	90	33	86	24	69	20	57	4	99
....	....	116	57	103	48	94	40	90	29	56	14	54	— 7	....
108	51	....	....	....	....	....	....	....	....	....	....	....	....	....
100	50	110	60	103	50	88	29	86	25	58	17	58	— 5	132
96	36	104	48	98	42	....	....	89	....	78	14	61	8	....
89	37	94	49	89	41	77	29	....	....	....	....	....	....	....
98	49	102	57	100	50	88	34	78	28	60	19	55	3	....
92	38	100	45	....	....	91	35	....	....	65	16	52	— 7	....
83	32	90	40	89	35	73	21	....	....	50	13	....	....	....
....	....	103	52	98	42	90	30	86	21	64	13	51	5	....
102	45	109	57	103	52	97	35	90	26	....	....	56	11	....
97	50	104	60	102	50	88	38	84	35	55	20	52	— 2	114
96	50	103	56	102	62	88	32	82	28	58	12	48	—10	113
88	30	98	37	94	36	80	25	81	20	56	12	48	—11	....
95	50	105	57	98	48	93	37	85	28	62	21	47	— 3	....
89	45	96	52	....	....	85	38	85	28	59	27	47	11	....
97	62	106	65	102	56	93	38	85	28	65	18	58	8	....
102	50	105	52	102	60	95	20	78	22	....	....	50	—12	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
93	41	102	47	97	40	87	29	87	24	60	11	52	— 8	116
92	48	102	60	97	43	86	40	79	30	53	15	50	— 4	116
90	28	97	33	87	35	83	26	65	6	54	1	49	—19	....
91	31	92	57	86	49	88	40	66	19	58	0	[k]49	—16[k]	122
85	44	85	51	82	46	82	37	71	17	66	16	58	0	106
86	40	89	48	81	44	78	36	64	15	57	12	51	— 6	114
....	....	....	....	88	41	88	33	68	13	59	4	61	— 8	....
88	42	87	52	85	43	85	38	71	22	65	18	63	4	103
87	41	86	48	84	44	84	35	71	21	64	16	61	3	104
88	42	87	51	84	45	88	36	65	22	62	17	57	4	106
91	41	88	50	86	44	85	36	73	20	65	15	62	4	103
86	39	86	46	84	40	84	36	60	23	67	17	62	4	....
....	....	87	40	84	38	81	25	64	11	56	7	....	....	....
88	37	86	42	84	41	85	34	63	16	60	13	54	— 8	....
....	[h]55	....	54	....	45	....	40	65	17	....	....	....	1	....
94	35	92	42	86	40	88	36	66	11	58	16	53	— 3	120
90	40	84	47	81	43	81	32	63	21	60	15	51	— 2	100
96	34	96	40	91	42	90	32	67	12	65	13	56	— 8	124
86	40	84	49	82	47	78	34	62	15	62	13	57	— 4	104
87	30	86	40	82	36	84	31	67	8	63	18	50	—22	138
89	39	88	52	90	50	89	35	74	29	68	18	68	19	....
87	48	93	55	90	52	80	43	70	34	62	22	65	21	92
88	50	88	56	84	57	82	45	71	37	64	25	68	22	87
91	48	90	58	91	52	88	41	82	32	67	21	71	15	90
92	57	92	64	90	58	86	47	78	35	60	26	62	20	88
89	59	92	67	89	63	85	48	78	37	65	28	67	24	86
87	50	90	57	87	56	89	46	75	36	69	25	69	24	85
88	47	89	51	88	50	83	40	80	32	66	19	69	19	90
88	37	88	52	86	52	86	41	75	30	66	20	66	15	90
91	40	93	51	88	49	87	40	72	25	65	17	65	9	95
89	42	89	48	85	46	83	34	68	23	60	13	63	8	....
88	46	89	54	87	52	87	41	73	31	66	20	67	10	89
91	48	91	55	89	52	89	42	78	32	65	22	64	16	....
[d]94	50	....	....	[j]89	54	[g]84	46	73	33	64	29	64	14	....
89	54	89	60	86	54	88	43	75	33	64	28	68	18	87
89	49	94	53	89	50	85	39	76	31	63	20	67	13	97
90	41	90	51	90	50	90	39	74	27	64	17	66	10	93

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
New Jersey—Continued.	°	°	°	°	°	°	°	°	°	°
Moorestown	58	19	45	0	63	25	77	30	89	38
Newark	56	17	48	5	63	26	79	35	88	42
New Brunswick (1)	58	18	47	5	62	28	76	35	87	41
New Brunswick (2)	59	15	52	0	64	25	78	29	89	36
New Brunswick (3)	58	15	51	0	64	24	79	28	....	....
Ocean City	52	29	45	2	50	28	71	34	88	46
Oceanic	58	20	52	4	67	27	80	37	91	40
Paterson	65	14	51	1	64	19	77	36	89	44
Plainfield	58	13	57	-1	65	23	80	27	91	36
Princeton	58	16	46	0	62	24	76	28	90	38
Rancocas	59	18	....	0	64	24	79	31	90	40
Readington	58	16	48	2	60	26	78	34	86	46
Somerville	59	16	49	2	64	24	76	30	....	....
South Orange	58	14	48	0	63	22	77	30	90	38
Tenafly	67	8	55	0	70	19	83	25	94	35
Tom's River	56	16	52	0	66	20	84	28	90	35
Trenton	60	18	49	-2	65	27	79	34	90	40
Union	56	15	46	0	61	25	76	32	88	44
Woodbury	....	....	....	....	....	....	[i]78	34	90	42
New Mexico:										
Albuquerque	....	....	....	....	....	....	84	33	89	34
Coolidge	[h]45	-12	52	-19	68	24	80	25	93	28
Deming	60	22	70	12	83	30	89	43	100	55
Fort Bayard	70	6	67	10	77	25	85	32	88	30
Fort Marcy	....	....	....	....	....	....	78	24	83	29
Fort Seldon	....	....	[f]72	24	63	....	96	41	99	30
Fort Stanton (1)	....	....	....	....	....	....	77	25	86	28
Fort Stanton (2)	54	5	57	13	72	20	77	25	83	32
Fort Union	58	-10	58	7	68	....	76	19	75	21
Fort Wingate	48	-7	46	-7	66	18	77	26	80	27
Gallinas Spring	52	8	59	13	70	29	81	33	87	41
Hillsborough	....	....	....	....	....	....	....	....	....	....
Las Vegas	54	-11	58	0	70	14	79	24	83	31
Lava	61	1	67	8	80	23	91	30	99	35
Lordsburg	61	20	69	14	67	37	94	40	97	62
Los Lunas	....	....	....	....	....	....	[e]92	44	92	42
Santa Fé	46	0	50	-1	66	20	75	26	80	32
New York:										
Albany	62	6	43	-5	65	19	80	30	92	36
Alfred Centre	....	....	....	....	....	....	[g]78	22	89	26
Angelica	49	-2	38	-22	59	10	82	21	89	26
Arcade	....	....	....	....	....	....	....	....	90	26
Ardenia	62	14	48	5	64	25	77	36	89	45
Auburn	54	2	....	....	....	....	....	....	87	31
Barnes' Corners	50	-10	41	-34	44	-3	75	22	....	....
Boyd's Corners	55	10	47	-2	68	23	80	31	93	43
Buffalo	55	8	48	-10	54	14	74	28	89	34
Canton	48	-5	40	-35	48	10	81	23	90	34
Central Park (New York City)	57	14	49	1	61	25	78	34	91	42
Constableville	45	-4	40	-25	47	6	75	15	89	34
Cooperstown	54	4	41	-15	55	17	76	29	86	35
Davids Island	52	11	50	-1	....	21	[c]74	23	90	38
Eden	45	10	44	2	45	18	75	32	92	31
Elmira	51	6	[e]41	-7	[e]57	19	74	30	90	39
Factoryville	57	-2	43	-13	60	18	80	23	89	31
Fleming	....	2	....	-4	....	18	[m]72	26	94	28

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
88	50	92	57	85	54	84	44	79	32	66	23	65	16	92
89	52	88	59	87	55	81	45	71	32	66	25	65	12	84
87	52	87	61	85	55	84	47	72	33	65	27	65	15	82
87	47	88	54	86	54	86	43	72	31	65	21	68	12	89
87	46	88	54	86	52	85	41	71	30	....	....	67	12	....
88	50	91	62	89	65	83	50	73	35	64	27	60	22	89
91	52	93	59	95	58	85	45	75	39	66	25	67	22	91
89	55	....	....	....	....	....	....	....	....	....	....	....	....	....
90	41	92	55	91	51	90	38	76	29	65	18	68	8	93
91	48	91	55	....	....	85	46	72	31	64	24	65	13	....
89	53	90	60	89	56	....	....	75	32	65	23	68	15	....
90	60	96	64	88	62	88	50	72	36	72	26	70	20	94
88	46	90	53	86	51	....	....	72	31	65	20	67	12	....
91	41	93	48	88	45	89	37	75	29	74	13	68	10	94
89	42	88	53	88	42	....	....	74	30	....	....	....	....	....
90	55	92	64	90	58	88	46	75	33	64	30	69	16	94
86	55	86	57	86	55	81	45	72	32	64	22	65	12	88
88	50	92	61	90	56	86	44	81	34	66	26	67	20	....
95	47	100	58	96	57	89	35	85	29	64	17	66	10	....
100	30	100	48	97	46	93	25	83	17	60	6	....	....	....
104	60	110	70	109	74	100	48	86	40	76	30	72	20	98
92	43	95	56	95	51	89	37	85	30	72	18	....	17	89
90	40	94	50	91	52	87	27	82	25	61	9	61	— 3	....
106	43	109	67	108	56	104	39	93	29	77	17	77	— 9	....
90	36	93	48	91	46	88	32	82	22	67	8	70	4	....
91	37	92	50	90	46	86	33	79	23	66	10	68	5	87
82	35	90	42	81	42	81	24	76	20	58	8	59	1	....
88	38	....	53	[n]85	50	....	....	....	....	70	2	66	3	....
94	52	95	60	93	60	89	37	84	35	64	12	68	17	87
[k]93	46	100	57	95	55	91	39	81	32	70	14	69	17	....
95	36	97	48	97	58	89	28	85	30	60	6	65	— 6	108
103	43	104	58	101	55	100	40	85	28	68	10	70	12	103
98	64	105	70	105	74	95	46	85	45	70	28	74	25	91
96	52	101	56	104	50	96	41	94	42	68	26	71	20	....
86	37	90	52	88	54	83	29	78	28	60	13	59	10	91
88	47	89	54	88	51	86	42	71	28	62	20	66	6	97
82	41	86	45	80	42	80	34	62	19	58	14	57	6	....
83	39	88	44	81	38	84	30	62	42	59	8	58	5	111
84	36	91	42	84	40	....	....	....	....	....	....	....	....	....
86	55	88	61	85	57	83	48	69	29	63	25	66	9	84
82	41	88	52	82	49	80	39	68	23	68	24	67	5	....
93	56	90	61	90	55	86	41	73	30	63	24	66	6	95
83	45	88	54	84	51	86	41	62	26	65	20	57	12	99
85	38	92	50	[b]79	47	84	34	65	16	62	13	49	— 6	127
91	52	89	58	84	47	82	46	73	32	63	25	64	13	90
84	44	88	50	....	....	83	33	60	15	57	10	50	0	....
82	45	85	53	80	50	80	36	65	19	57	14	55	3	101
86	41	90	51	85	53	83	42	71	34	63	22	66	11	....
82	46	90	56	84	54	90	44	59	36	63	18	60	10	90
89	50	90	53	85	48	84	40	67	19	61	16	62	8	97
83	41	88	45	84	41	83	34	68	16	60	15	61	6	102
87	46	92	52	95	52	98	44	72	26	59	16	57	0	....

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.
	°	°	°	°	°	°	°	°	°	°
New York—Continued.										
Fort Columbus	55	17	49	1	60	25	73	34	86	40
Fort Hamilton	54	17	47	2	61	26	74	33	86	40
Fort Niagara	48	10	46	-6	55	20	78	27	87	35
Fort Porter	50	4	44	-11	55	15	75	27	89	35
Fort Schuyler	54	16	49	0	61	24	71	34	81	40
Fort Wadsworth	56	16	50	1	65	24	79	29	92	38
Friendship	48	4	40	-18	71	16	76	26	91	28
Geneva	50	8	43	-12	65	17	80	23	96	32
Hess Road Station	50	9	40	-9	54	14	76	30	85	39
Honeymead Brook	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Humphrey	47	5	38	-16	57	16	80	25	89	35
Ilion	58	5	41	-20	60	17	83	22	93	28
Ithaca	58	0	44	-12	60	18	80	26	92	34
Kingston	b55	1	46	-4	62	16	82	20	97	29
Le Roy	50	3	44	-9	60	15	85	25	92	27
Lowville	54	-1	45	-24	52	12	.....	.....	96	32
Lyons	54	4	41	-3	61	19	83	28	91	35
Madison Barracks	51	-9	44	-26	57	10	84	23	92	34
Middleburgh	61	-9	52	-22	62	7	84	12	94	21
Newfane Station	.....	8	.....	-14	.....	14	.....	.....	.....	38
New York City	58	17	50	2	62	25	80	34	87	40
Nineveh	52	-8	44	-30	75	8	82	24	94	34
North Hammond	50	-2	48	-22	60	10	80	25	90	36
Number Four	50	-8	40	-27	51	5	73	13	88	26
Oswego	53	1	42	-5	58	20	82	28	90	35
Palermo	52	-6	40	-9	50	13	83	23	89	30
Palmyra	48	6	42	-9	66	18	88	32	94	42
Pendleton Centre	.....	6	.....	-4	.....	14	.....	30	.....	38
Perry City	49	1	42	-14	60	14	80	28	89	30
Plattsburgh Barracks	54	0	48	-20	52	14	75	19	92	39
Potsdam	45	-6	48	-26	46	12	84	24	90	40
Queensbury	.....	-10	.....	-26	.....	16	.....	32	.....	40
Rochester	49	4	45	-9	61	17	85	28	92	31
Rome	.....	.....	.....	.....	.....	.....	.....	.....	93	28
Salem	59	-1	c45	-24	59	9	78	23	89	31
Saranac Lake	46	-12	45	-34	53	6	f73	14	91	30
Savona	55	5	43	-13	60	11	83	22	93	30
Setauket	58	16	54	5	60	26	74	35	88	42
Somerset	.....	8	.....	-14	.....	10	.....	30	.....	40
South Canisteo	56	8	48	-12	60	14	83	28	90	36
South Kortright	53	4	45	-14	.....	20	.....	30	84	32
Tannersville	.....	.....	.....	.....	g52	-4	.....	.....	e84	32
Turin	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Utica	60	6	40	-23	60	14	84	24	95	26
Watervliet Arsenal	54	3	44	-8	63	21	80	27	92	32
Wedgewood	58	2	44	-12	61	16	80	28	92	32
West Point	60	8	50	-4	62	20	76	24	88	35
White Plains	56	10	46	-4	62	26	74	38	84	45
Willets Point	54	11	46	1	62	27	76	33	88	41
North Carolina:										
Asheville	60	13	70	6	73	21	83	28	90	30
Chapel Hill	70	20	68	10	74	27	d90	33	97	38
Charlotte	70	22	69	13	75	28	86	38	95	38
Clear Creek	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fayetteville	.....	.....	.....	.....	.....	.....	90	44	98	52
Franklin	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Goldsborough	.....	.....	.....	.....	.....	.....	.....	.....	95	44
Grover	.....	.....	.....	.....	.....	.....	.....	.....	94	44

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		Range.
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
87	40	91	56	87	56	83	49	72	36	63	27	62	15	90
85	52	87	62	85	57	79	48	73	35	68	22	67	14	85
82	47	93	56	84	52	90	42	70	25	65	23	61	15	99
80	45	88	51	85	52	86	39	64	24	59	19	55	10	100
84	49	88	57	84	54	80	47	70	26	64	17	61	13	88
89	49	92	54	87	54	83	45	75	33	64	21	66	15	91
82	46	88	50	86	40	.....	.....	.....	.....	.....	.....	.....	.....	....
88	43	95	48	90	47	k86	43	71	18	61	19	62	9	108
80	47	91	42	85	45	88	23	66	19	62	18	57	10	100
87	38	88	48	87	44	86	36	71	18	63	11	63	3	....
82	46	87	53	87	48	89	37	81	25	60	19	64	7	105
90	34	90	47	85	43	86	33	72	18	58	14	59	9	113
88	42	92	50	86	48	84	38	68	18	60	14	60	4	104
94	38	95	44	95	40	92	34	74	20	62	13	64	5	101
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....
84	40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....
87	46	92	53	86	50	84	40	68	22	70	22	62	10	95
84	41	90	36	84	33	90	35	69	14	62	2	57	— 3	118
91	29	91	44	88	44	88	36	75	17	60	16	64	2	116
.....	46	.....	64	.....	.....	.....	44	.....	.....	.....	.....	.....	.....	....
88	53	88	60	90	56	85	46	73	35	65	27	65	13	88
88	48	90	56	90	50	90	38	92	16	82	12	78	8	124
86	50	94	57	88	55	90	42	67	16	56	15	56	— 5	116
83	30	84	40	80	38	80	27	60	15	55	5	50	— 5	115
83	43	87	52	86	51	84	42	67	24	63	20	60	6	95
86	42	87	47	84	41	83	31	67	20	60	15	50	2	98
84	50	92	60	87	53	88	40	65	18	64	20	63	16	103
.....	50	.....	60	.....	57	.....	45	60	28	.....	22	.....	11	....
85	46	91	50	85	47	85	34	69	13	60	12	58	— 3	105
85	42	86	50	86	45	83	35	62	18	60	14	55	— 5	112
83	50	89	52	.....	.....	87	38	64	20	61	14	53	— 8	....
.....	53	80	60	.....	51	.....	35	.....	.....	56	15	65	0	....
81	44	88	52	85	49	88	39	67	23	63	20	61	14	101
89	33	89	52	83	45	88	32	65	20	57	16	58	8	....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....
86	36	83	45	83	41	84	32	60	12	61	13	52	— 8	125
89	42	92	43	g86	40	85	32	68	14	59	12	.....	.....	....
84	50	86	58	83	56	81	48	70	37	64	25	64	17	83
.....	48	86	62	.....	58	.....	.....	.....	.....	.....	.....	.....	.....	....
87	48	86	53	84	46	82	35	65	18	58	14	59	7	102
.....	44	.....	50	.....	44	.....	33	.....	19	.....	15	.....	6	....
80	34	80	40	80	36	78	33	66	16	.....	.....	.....	.....	....
.....	.....	.....	.....	.....	53	.....	44	.....	20	.....	14	j59	3	....
96	30	100	48	88	42	91	32	69	18	61	15	62	7	123
86	41	88	51	86	49	83	37	65	19	63	18	64	5	100
85	44	93	52	86	51	86	40	66	24	60	18	60	7	105
88	42	89	50	88	46	84	40	72	24	64	12	60	4	93
83	56	85	58	80	56	78	44	70	34	62	24	66	10	89
86	48	86	58	84	53	81	45	73	35	63	23	66	15	87
90	37	91	57	83	50	82	36	78	27	72	15	72	16	85
.....	.....	.....	.....	.....	.....	.....	.....	86	34	81	23	76	23	....
94	45	96	64	90	58	89	45	82	34	77	21	76	27	83
.....	.....	.....	.....	84	60	84	44	78	34	70	18	73	18	....
.....	60	.....	69	.....	63	.....	53	.....	.....	.....	.....	.....	.....	....
.....	.....	90	53	86	53	84	33	70	20?	70	11	72	12	....
94	54	98	62	90	53	88	46	83	36	82	27	.....	.....	....
.....	46	.....	64	84	60	.....	46	.....	.....	.....	.....	.....	.....	....

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
North Carolina—Continued.	°	°	°	°	°	°	°	°	°	°
Hatteras	65	32	67	22	63	35	69	38	84	52
Highlands	....	....	....	....	....	....	....	....	....	....
Hot Springs	60	17	69	11	76	27	85	31	88	33
Kitty Hawk	70	29	69	18	74	30	82	41	94	46
Lenoir	60	14	62	8	67	27	85	30	89	35
Lumberton	....	....	....	....	....	....	....	....	97	40
Monroe	68	22	67	16	73	28	85	36	93	41
Morganton	....	....	a65	21	77	30	88	32	94	37
Mount Airy	....	....	....	....	....	....	86	....	....	34
Mount Pleasant	69	17	66	10	74	23	88	32	94	34
New Berne	79	20	68	13	77	27	....	....	91	45
Pittsborough	....	....	....	....	....	....	....	....	....	....
Raleigh (1)	....	....	67	17	73	30	91	38	95	46
Raleigh (2)	68	21	68	13	74	27	89	32	94	40
Salisbury	67	30	67	20	69	32	85	41	93	45
Soapstone Mount	....	....	....	....	....	26	....	34	b98	34
Southern Pines	....	....	72	20	76	36	91	39	98	47
Southport	65	26	61	20	70	29	73	40	87	44
Statesville	64	20	67	12	72	28	86	36	92	36
Wadesborough	....	....	....	....	....	....	....	....	95	38
Wake Forest	....	....	66	11	72	25	88	32	93	37
Washington	....	....	a71	28	....	....	88	40	92	53
Weldon (1)	68	17	66	11	74	24	88	32	95	39
Weldon (2)	....	....	....	....	....	....	....	....	98	35
Wilmington	69	29	67	20	72	33	86	42	97	45
Winslow	....	....	....	....	....	....	....	....	....	....
North Dakota:										
Bismarck	46	−18	48	−34	69	4	85	20	81	22
Carrington	....	....	....	....	77	−4	87	17	85	23
Davenport	42	−30	40	−38	68	−2	83	21	91	21
Fort Abraham Lincoln	44	−19	47	−30	67	2	83	21	80	24
Fort Buford (1)	46	−20	51	−34	78	−3	81	12	78	21
Fort Buford (2)	45	−18	51	−32	72	−3	76	15	76	27
Fort Pembina	51	−27	36	−43	70	−8	74	11	83	23
Fort Totten	45	−25	46	−36	71	−3	84	19	82	29
Fort Yates (1)	45	−17	46	−26	70	5	87	26	84	23
Fort Yates (2)	53	−15	52	−25	72	5	81	20	85	20
Gallatin	44	−32	40	−44	66	−6	84	16	82	28
Napoleon	....	....	....	....	....	....	....	....	....	....
New England City	39	−25	43	−33	66	0	85	19	80	20
Steele	....	....	....	....	....	....	87	10	84	16
Wahpeton	....	....	....	....	....	....	....	....	....	....
Ohio:										
Akron	54	13	54	−5	68	18	80	22	88	33
Ashland	....	....	....	....	....	....	....	....	....	....
Athens	58	15	63	3	74	20	83	24	89	30
Bangorville	54	7	56	−6	70	14	79	15	90	32
Beallsville	....	....	....	....	....	....	....	....	b92	40
Bellevue	54	12	50	−3	70	20	80	24	90	30
Bement	....	....	....	....	....	....	....	....	....	....
Canton	58	3	54	−4	69	20	81	20	90	32
Carrollton	....	....	....	....	....	22	....	25	....	38
Celina	58	13	61	−1	74	20	80	22	91	33
Cincinnati	58	19	68	6	76	25	83	25	90	38
Cleveland (1)	55	13	47	−7	64	20	83	25	89	33
Cleveland (2)	57	13	56	−7	64	22	83	25	89	34
College Hill	50	16	66	5	77	26	82	25	92	40
Clarksville	56	15	65	3	74	18	82	20	91	32

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
84	58	87	67	84	67	83	57	78	46	74	35	69	38	65
82	32	77	44	82	46	79	30	74	20	64	8	64	8	....
87	40	90	60	84	53	86	41	77	26	70	21	72	22	79
98	54	100	61	e96	62	.....	.....	.....	.....	77	30	71	32	....
84	43	87	63	82	56	83	40	77	30	71	23	70	19	81
96	50	98	62	70	58	90	44	84	32	82	20	.....	.....	....
94	51	93	66	86	57	86	44	82	34	78	22	.....	.....	....
90	51	93	65	89	55	88	40	76	26	72	20	.....	.....	....
90	44	95	57	87	52	87	35	80	26	74	21	72	14	....
92	45	94	62	89	56	88	38	82	29	80	19	76	20	84
92	50	94	58	90	58	86	42	82	32	78	24	78	26	....
.....	.....	92	62	86	57	85	40	79	34	74	27	72	20	....
94	54	.....	.....	91	60	90	47	85	36	83	25	77	27	....
93	49	95	62	90	56	87	42	82	34	80	24	75	25	82
91	52	94	71	87	63	87	46	78	36	73	24	72	29	74
92	50	.....	64	.....	58	.....	40	.....	34	.....	18	.....	20	....
98	60	.....	.....	.....	.....	m90	48	82	42	79	36	75	37	....
87	58	91	66	87	61	86	48	81	40	75	26	70	32	71
91	45	93	66	88	58	86	42	.....	.....	.....	.....	.....	.....	....
94	48	96	64	88	60	88	44	84	34	78	22	.....	.....	....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....
88	63	90	70	88	67	.....	.....	.....	.....	.....	.....	74	28	....
94	50	96	59	90	59	87	42	81	32	78	24	74	20	85
94	42	98	54	90	55	.....	.....	.....	.....	.....	.....	.....	.....	....
93	58	94	66	87	63	87	48	83	37	78	27	76	30	77
.....	.....	.....	.....	87	56	85	40	82	33	79	25	75	22	....
97	42	95	48	102	44	93	26	86	23	63	—12	42	— 6	136
97	40	101	45	99	40	.....	.....	.....	.....	.....	.....	.....	.....	....
92	36	96	40	95	38	95	31	73	19	58	— 5	44	— 7	134
98	42	96	48	104	48	96	26	83	23	64	—12	44	— 8	134
104	37	101	41	99	42	87	25	88	15	61	—28	44	—11	138
101	38	98	41	99	42	87	26	89	15	61	—28	44	—12	133
96	35	97	37	97	33	96	26	78	10	63	— 8	40	—20	140
95	42	96	37	97	46	98	29	82	21	58	— 8	36	—11	134
100	39	101	38	107	41	97	28	.....	23	.....	— 9	52	— 5	133
99	43	99	50	102	48	97	30	84	23	67	— 8	52	— 3	127
100	40	102	46	98	42	96	28	80	18	60	—12	40	—12	146
98	50	96	45	105	43	96	25	82	20	59	— 7	49	— 9	....
104	34	f97	37	101	37	86	25	85	12	61	—20	50	—14	137
99	38	101	40	110	39	99	22	94	16	63	—13	43	—11	....
.....	.....	95	40	96	38	97	31	81	19	75	— 4	48	— 4	....
85	42	90	49	88	48	96	40	73	26	65	16	65	18	101
.....	.....	.....	.....	.....	.....	88	42	74	24	63	17	62	18	....
82	40	92	52	91	48	92	34	77	24	72	18	67	14	89
86	38	93	52	88	50	89	34	73	24	64	16	64	12	99
91	50	95	58	90	52	.....	.....	.....	.....	.....	.....	.....	.....	....
84	44	92	58	89	53	86	38	76	26	64	14	64	17	95
.....	.....	.....	.....	88	55	80	45	75	28	56	26	68	20	....
88	40	94	50	88	46	89	38	74	24	70	18	66	17	98
.....	45	92	60	.....	54	.....	.....	.....	29	.....	18	.....	21	....
84	42	89	53	89	50	90	37	77	27	64	20	70	23	92
88	39	92	61	92	56	92	40	80	30	72	20	69	21	86
88	41	92	52	88	51	88	43	72	29	66	18	66	19	99
88	41	92	53	88	50	89	43	72	29	66	18	66	19	99
90	46	93	64	95	62	92	42	72	31	67	14	66	22	90
88	42	92	54	92	49	95	34	79	24	71	17	68	16	92

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Ohio—Continued.	°	°	°	°	°	°	°	°	°	°
Collinwood	45	16	49	−2	70	21	83	30	....	38
Columbus	56	16	62	1	74	21	82	22	91	36
Columbus Barracks	56	16	62	0	76	18	84	20	96	33
Dayton	56	13	64	−1	73	17	82	20	93	32
Demos	56	18	52	0	68	24	78	27	85	36
Elyria	56	14	53	−4	69	16	....	....	90	31
Findlay	....	....	....	....	....	....	....	....	....	....
Fostoria	55	9	55	−4	74	13	....	....	92	33
Garrettsville	55	−6	45	−18	69	10	81	18	87	24
Georgetown	55	16	65	6	80	17	84	24	93	36
Granville	54	11	60	−1	72	18	79	19	89	34
Gratiot	57	14	58	0	76	19	84	23	92	35
Greenville	55	14	59	0	70	18	78	22	88	32
Hanging Rock	50	15	67	6	75	21	85	26	90	31
Hiram	54	7	50	−12	64	14	79	19	85	30
Jacksonborough	52	12	62	0	74	20	85	20	94	36
Jefferson	55	9	44	−14	66	15	83	24	87	30
Kent	....	....	50	−6	75	18	80	23	94	27
Kenton	46	15	49	−2	78	13	83	23	94	34
Leipsic	....	....	....	....	....	....	....	....	....	....
Logan	56	13	....	3	78	17	85	22	93	31
Lordstown	52	3	44	−12	70	11	80	21	89	28
Marietta	59	17	58	3	74	23	85	23	89	32
McConnellsville	56	10	57	0	75	19	84	22	91	30
Napoleon*	56	11	55	−3	68	12	80	21	93	31
New Alexandria	53	11	55	−4	68	17	81	18	89	33
New Athens	....	....	....	....	....	....	....	....	....	....
New Comerstown	54	11	56	−1	70	15	85	19	94	31
North Lewisburgh	56	11	56	−3	72	17	88	21	95	34
Oberlin	56	10	52	−4	66	14	79	24	87	32
Ohio State University	56	16	62	1	74	17	82	21	91	32
Orangeville	....	....	....	....	....	6	68	24	....	30
Poland	....	....	....	....	....	14	....	25	....	34
Pomeroy	60	20	60	8	75	24	87	27	94	31
Portsmouth	61	21	68	8	82	25	88	28	90	36
Salineville	....	....	....	....	....	15	72	22	....	38
Sandusky	57	13	55	−1	64	21	83	23	90	36
Shanesville	....	....	....	....	....	....	77	23	88	34
Shiloh	....	....	....	....	....	....	....	....	85	29
Sidney	55	11	59	0	72	19	80	21	94	33
Tiffin	54	12	53	1	68	19	80	27	89	39
Toledo	58	12	54	−5	64	18	81	21	89	34
Upper Sandusky	56	14	53	−4	70	16	80	20	90	33
Vienna	....	....	....	....	....	13	80	24	91	35
Wapakoneta	54	12	46	−4	71	15	80	18	96	30
Wauseon	55	1	52	−13	71	10	79	19	91	26
Waverly	....	....	....	....	....	....	....	....	....	....
West Milton	59	12	62	2	79	21	82	24	98	35
Westerville	54	15	57	0	74	18	82	21	91	32
Wooster	54	12	54	−5	71	16	80	21	90	30
Yellow Springs	....	10	66	−2	72	15	80	18	90	33
Youngstown	55	3	45	−8	69	14	82	22	93	28
Oregon:										
Albany	56	22	65	26	76	32	74	34	87	43
Ashland	59	24	67	24	76	35	83	41	91	47
Astoria	56	30	60	25	72	38	68	40	82	45
Baker City	....	....	....	....	....	....	....	....	....	....
Bandon	64	32	67	26	71	34	66	42	77	46

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
86	42	92	56	91	51	91	38	78	29	67	21	67	20	91
90	42	98	51	96	47	97	34	80	24	70	20	66	18	98
89	42	94	54	92	46	93	33	79	23	67	19	68	20	95
82	39	88	56	84	47	88	36	72	25	69	19	64	19	88
88	38	95	50	88	48	90	40	77	25	64	17	66	19	....
.....	.....	.....	.....	.....	.....	90	30	78	20	63	12	67	17	....
.....	42	93	49	94	49	.....	.....	80	23	63	19	67	22	....
85	38	91	43	89	40	89	34	73	16	66	6	65	4	109
92	43	96	54	100	54	98	38	82	26	74	11	72	15	94
86	40	92	53	92	50	92	36	76	27	66	18	.....	.....	....
90	43	93	55	90	48	93	38	75	27	69	20	69	11	93
83	44	86	54	88	50	88	35	72	25	62	18	64	20	88
89	41	93	56	92	52	92	35	81	28	77	18	73	17	87
83	42	89	53	90	50	90	39	72	23	64	14	66	16	102
91	42	93	61	92	58	90	36	70	28	68	15	64	20	94
82	43	88	49	88	47	91	36	67	24	65	17	64	15	105
88	36	93	50	88	47	91	33	75	25	65	16	65	20	....
86	44	92	55	88	51	92	36	80	26	71	20	77	20	96
88	46	94	62	92	55	92	40	80	28	.....	.....	.....	.....	....
90	40	97	52	94	46	96	39	79	23	73	20	69	14	94
86	45	92	42	88	38	90	34	72	16	64	16	65	12	104
88	42	90	56	90	50	90	39	76	26	73	22	70	16	87
88	41	95	54	94	46	93	36	79	22	72	18	69	14	95
88	41	96	53	92	48	88	33	78	22	m60	16	66	19	99
85	41	92	52	88	48	89	39	74	25	67	18	64	15	96
90	38	96	51	92	45	92	40	75	27	.....	.....	.....	.....	....
88	40	94	50	89	45	91	37	71	20	66	19	66	14	95
89	42	96	55	93	49	94	36	83	25	64	16	67	13	99
85	40	90	51	84	48	87	40	74	24	65	11	65	19	94
86	42	92	49	93	40	93	31	79	22	66	21	67	17	92
.....	44	86	52	.....	42	.....	34	.....	16	.....	16	.....	8	....
.....	44	.....	50	.....	46	.....	40	.....	21	.....	18	.....	14	....
92	42	96	55	90	48	92	38	79	27	71	23	66	15	88
90	45	94	56	90	54	89	40	80	28	76	18	70	20	86
.....	.....	.....	.....	.....	.....	.....	.....	.....	30	.....	20	.....	15	....
86	42	93	56	87	52	90	40	76	27	68	16	70	20	94
87	45	93	62	90	55	91	41	75	29	.....	18	59	21	....
82	42	90	49	87	46	90	33	66	25	62	16	65	20	....
90	41	95	50	88	50	90	31	.....	.....	62	16	66	19	....
86	45	91	50	88	57	89	40	75	28	62	18	70	21	90
85	42	91	55	90	52	88	36	78	26	63	14	70	20	96
85	40	92	49	88	48	89	35	75	23	64	15	65	20	96
90	42	95	51	89	50	90	39	m72	29	62	15	63	9	....
90	38	98	49	94	48	92	31	79	23	62	15	65	10	102
85	38	93	46	94	45	90	28	80	17	62	9	64	15	107
89	44	94	59	93	54	91	37	82	26	74	21	71	16	....
95	43	98	58	95	52	95	37	85	28	67	20	68	20	96
88	41	92	52	88	45	90	34	75	23	67	19	h61	14	92
87	38	92	48	90	45	92	37	76	22	65	16	64	18	97
86	42	90	54	89	47	89	33	76	23	64	17	66	15	92
89	42	92	51	88	46	90	36	75	21	64	17	65	15	101
95	45	96	48	88	43	97	32	75	42	63	32	52	24	74
98	55	97	60	89	46	89	39	78	38	60	26	50	16	82
88	46	84	52	77	50	87	41	73	44	63	35	52	30	63
.....	.....	95	51	l95	37	83	27	85	29	56	10	49	2	....
68	49	71	50	70	48	80	36	71	40	74	32	58	29	54

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°
Oregon—Continued.										
Beulah	....	....	....	....	....	....	....	....	....	....
Cascade Locks	....	....	....	....	....	....	....	....	....	....
Creswell	....	....	....	....	....	....	....	....	84	49
East Portland	50	23	64	20	75	32	79	33	87	48
Eola	50	20	61	21	70	33	75	42	84	43
Fort Klamath	48	— 7	63	3	70	15	80	20	90	24
Grant's Pass	....	....	....	....	82	29	88	33	96	35
Heppner	....	....	....	....	....	....	....	....	....	....
Hood River	....	....	....	....	....	....	....	....	....	....
Jacksonville	....	....	....	....	....	....	81	34	90	37
La Grande	....	....	....	....	....	....	79	31	83	34
McMinnville	54	19	60	20	75	30	75	30	....	....
Mount Angel	54	22	65	28	77	30	76	33	85	41
Portland	55	24	64	23	78	35	77	33	88	42
Roseburgh	59	22	68	22	80	29	76	34	87	40
St. Helen	....	....	....	....	....	....	....	....	....	....
Siskiyou	62	20	72	17	72	35	85	34	93	34
The Dalles	....	....	....	....	....	....	83	31	91	34
Tillamook	70	32	72	29	88	30	69	35	74	48
Vernonia	....	....	....	....	....	....	....	....	....	....
Pennsylvania:										
Allegheny Arsenal	55	12	54	— 3	72	23	86	25	91	33
Altoona	59	14	51	— 3	65	22	82	31	91	36
Annville	....	....	....	....	....	....	....	....	....	....
Aqueduct	....	....	....	....	67	35	87	39	99	43
Bethlehem	....	....	42	— 1	....	....	82	28	92	34
Blooming Grove	56	0	50	—12	61	22	85	29	....	....
Blue Knob	....	....	....	....	....	....	*62	30	94	34
Cannonsburgh	....	....	....	....	....	....	....	....	....	....
Carlisle	65	4	42	0	68	25	88	35	96	36
Catawissa	62	11	48	— 5	66	23	82	29	....	....
Chambersburgh	....	....	....	....	....	....	....	....	....	....
Charlesville	60	— 5	51	— 9	68	20	80	14	90	29
Clarion (2)	56	6	46	—21	67	9	80	21	86	28
Coatesville	62	14	49	— 3	67	21	83	27	94	34
Corry	50	4	42	—26	76	4	82	20	92	26
Coudersport	50	— 2	44	—27	....	....	78	19	90	26
Drifton	60	7	47	—13	61	15	77	26	89	33
Dyberry	57	— 6	41	—20	59	11	79	19	88	26
Eagle's Mere	50	— 1	40	—17	56	10	74	24	86	31
Edinborough	46	12	40	—21	60	13	76	22	86	30
Emporium	56	— 3	45	—20	65	11	84	21	92	25
Erie	53	12	54	—10	58	20	83	28	89	25
Forks of Neshaminy	....	....	....	....	60	24	80	34	87	44
Frankford Arsenal	59	17	50	— 2	65	25	76	30	90	36
Franklin	50	7	38	—22	64	10	80	24	86	32
Germantown	60	17	44	1	65	23	76	34	88	44
Girardville	51	10	41	— 4	61	19	78	23	89	33
Grampian Hills	52	6	42	—24	66	12	84	26	90	30
Greenville	55	9	49	—17	....	....	82	23	87	27
Harrisburg	62	13	44	— 1	62	23	80	34	90	40
Hollidaysburgh	61	— 2	49	— 7	68	18	84	25	94	27
Honesdale	54	— 3	39	—15	56	15	77	22	83	28
Huntingdon	61	— 2	41	— 8	65	19	81	26	93	28
Indiana	59	8	60	—11	69	17	82	38	85	40
Johnstown	....	....	....	....	....	....	....	....	....	....
Lancaster	64	14	44	1	64	21	82	28	91	36

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
....	....	....	....	....	....	93	24	92	23	60	7	48	— 7	....
....	....	89	....	....	....	82	59	....	....	60	30	49	....	....
91	48	97	58	87	52	88	29	78	32	66	26	52	23	....
90	52	96	52	84	52	87	40	76	36	58	30	52	22	76
90	47	94	56	85	47	91	46	73	38	62	30	51	18	76
92	28	98	25	....	....	....	....	....	....	....	....	....	....	....
102	41	104	40	96	38	98	29	87	36	72	24	53	23	....
96	37	101	42	94	39	91	31	79	32	65	23	....	....	....
....	....	....	....	....	....	84	42	80	34	60	28	48	16	....
96	46	99	46	91	44	95	38	80	37	67	28	48	19	....
90	43	95	41	92	38	84	28	84	32	56	23	46	10	....
....	....	....	....	....	....	95	29	76	30	64	29	....	....	....
92	40	96	44	85	42	96	35	77	32	63	28	....	....	....
94	43	96	46	87	46	89	38	80	38	64	32	53	25	73
95	43	97	42	90	45	90	35	82	35	64	29	57	24	75
....	....	....	....	....	....	88	34	79	37	66	30	56	24	....
98	46	99	53	92	48	92	40	85	36	68	33	50	18	82
95	47	98	48	93	42	86	35	76	32	60	21	50	14	....
78	46	85	53	71	46	93	34	70	34	66	31	51	14	79
....	....	....	....	....	....	88	30	75	34	62	26	50	19	....
88	43	94	53	93	47	94	40	78	25	70	21	68	19	97
88	48	93	55	88	52	86	41	71	26	62	25	65	21	96
....	....	....	....	....	....	91	50	82	32	71	31	68	20	....
90	55	96	60	88	55	83	41	77	23	66	19	70	15	....
88	46	94	54	86	46	83	40	73	28	66	21	68	12	....
91	48	92	58	87	52	83	40	73	22	60	10	62	7	....
90	40	94	49	86	44	86	38	70	22	60	12	60	13	....
....	....	....	....	84	45	88	36	74	23	69	19	68	11	....
93	50	....	....	95	52	....	....	78	22	63	21	70	15	....
....	....	91	52	84	49	80	39	70	25	67	22	62	17	....
....	....	....	....	....	....	86	34	78	23	68	20	64	15	....
86	43	96	48	87	42	....	....	....	....	65	16	66	12	....
....	....	....	....	....	....	86	31	71	19	66	16	63	10	....
90	42	94	52	89	46	88	37	83	29	64	19	69	17	97
90	38	88	42	92	37	92	31	68	14	63	12	60	8	118
86	35	89	39	85	38	88	31	....	....	59	10	....	....	....
86	44	88	50	84	44	84	44	68	26	60	17	61	10	102
85	33	89	42	84	36	82	31	70	14	61	10	64	8	109
....	....	86	51	79	48	74	36	66	18	60	16	51	0	....
82	40	87	50	83	44	85	36	62	22	63	17	60	8	108
90	38	93	41	86	41	84	35	69	15	60	15	62	12	113
82	45	87	54	81	52	85	42	69	30	68	25	70	12	99
82	54	....	....	84	59	82	48	....	....	....	....	....	....	....
90	53	95	57	89	52	86	42	81	32	65	21	68	20	97
86	44	90	52	82	44	84	34	64	14	60	12	58	10	112
88	50	88	60	85	58	84	48	68	30	63	25	66	18	87
85	47	90	53	95	48	80	37	70	25	65	21	64	16	99
88	48	94	52	86	40	86	32	70	20	58	16	60	8	118
87	42	95	45	84	39	90	34	74	19	67	16	65	11	....
87	50	92	57	85	53	82	44	76	29	62	24	66	14	93
90	40	95	47	90	41	87	32	76	17	67	18	64	10	102
82	35	86	44	80	39	80	34	68	18	61	14	61	8	101
89	38	90	48	90	43	87	35	76	18	65	17	69	12	101
87	44	....	....	....	....	88	35	73	21	66	14	....	....	....
....	....	....	....	86	46	85	42	73	21	67	19	67	10	....
....	....	....	....	....	....	87	39	80	27	65	20	....	....	....

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Pennsylvania—Continued.	°	°	°	°	°	°	°	°	°	°
Le Roy	53	5	48	—18	60	13	76	26	89	32
Lock Haven	57	0	49	—11	69	19	85	26	....	....
McConnellsburgh	64	2	56	2	66	22	82	25	93	31
Meadville	56	12	45	— 9	66	....	79	....	86	....
Meshoppen	....	....	....	....	....	28	....	28	....	31
Myerstown	....	....	....	....	....	....	....	....	94	33
New Bloomfield	64	0	51	0	66	19	83	27	93	29
New Castle	56	— 2	50	—11	69	9	84	21	90	26
Nisbet	....	....	....	— 2	....	26	....	34	....	41
Petersburgh	....	....	....	....	68	20	82	26	94	30
Philadelphia	59	18	51	2	66	25	78	34	90	43
Philipsburgh	56	— 1	56	—19	67	13	81	22	93	27
Pittsburgh	61	17	53	— 1	70	23	83	25	90	37
Pleasant Mount	....	....	....	—10	....	18	....	29	....	35
Pottstown	58	16	44	0	68	24	79	32	91	36
Quakertown	59	7	46	— 4	64	20	79	24	90	30
Reading	64	7	44	— 4	69	20	78	27	94	32
Rimersburgh	50	12	42	—13	70	12	82	23	91	35
Salem Corners	52	7	40	— 7	54	16	76	28	90	30
Selin's Grove	55	8	46	— 4	62	24	80	32	92	40
Smethport	52	— 2	43	—27	....	....	....	....	90	27
Somerset	54	8	50	—13	65	9	72	14	92	28
South Eaton	....	....	....	....	....	....	....	....	....	....
State College	57	10	48	—14	63	13	81	25	92	33
Swarthmore	56	18	48	0	65	24	77	30	90	38
Tipton	....	....	....	....	....	....	84	32	92	43
Troy	57	0	46	—16	60	18	79	25	89	38
Tuscarora	....	....	....	....	65	27	85	34	94	44
Uniontown	62	13	58	— 1	68	11	84	17	88	30
Wellsborough	58	— 2	54	—20	65	18	80	22	90	30
West Chester	58	16	46	— 2	64	22	77	30	90	38
Westtown	68	20	47	2	....	....	....	....	....	....
Wilkes Barre	....	....	....	....	....	....	....	....	....	....
Wysox	59	0	44	—15	63	21	81	22	89	30
York	....	....	....	....	....	....	82	32	94	35
Rhode Island:										
Block Island	56	10	48	2	49	24	58	32	70	40
Bristol	55	9	46	0	53	21	67	32	76	41
Fort Adams	....	9	47	— 1	56	21	72	21	76	36
Kingston (1)	....	....	....	....	....	....	71	26	88	35
Kingston (2)	....	....	....	....	....	....	....	....	....	....
Narragansett Pier	55	11	47	— 3	56	13	65	29	74	38
Newport	53	13	46	1	52	24	64	33	74	41
Olneyville	63	10	50	— 2	70	22	80	32	92	41
Providence (1)	58	11	48	0	....	....	75	32	85	40
Providence (2)	55	8	46	— 4	67	20	77	29	84	37
Woonsocket	56	8	46	— 4	62	20	74	28	86	40
South Carolina:										
Aiken	70	26	75	19	75	30	82	39	92	46
Allendale	....	....	....	....	....	....	....	....	97	41
Batesburg	....	....	....	....	....	....	82	41	95	42
Belmont	....	....	67	15	74	30	83	34	94	41
Blackville	....	....	....	....	....	....	....	....	98	d44
Brewer Mine	68	19	66	12	76	26	89	39	100	39
Branchville	....	....	....	....	....	....	....	....	97	41
Cedar Spring	78	22	68	16	76	20	86	30	95	35
Charleston	71	29	70	26	74	34	85	42	96	49
Cheraw	....	....	....	....	....	....	....	....	95	40

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
86	45	93	50	83	48	84	37	66	20	57	14	58	0	111
....	....	....	....	....	....	87	36	....	....	62	12	66	14	....
87	40	92	48	....	....	....	....	77	26	66	22	67	15	....
....	....	89	....	84	....	84	....	69	10	....	....	....	....	....
....	48	....	48	82	40	....	45	....	....	....	....	....	10	....
87	43	....	....	89	47	88	36	76	27	58	28	67	16	....
90	40	94	40	90	40	88	34	75	20	64	19	68	13	94
87	38	....	....	91	42	90	31	73	17	68	18	66	12	....
....	53	....	59	....	54	....	42	....	24	....	22	....	14	....
90	44	97	49	96	42	90	31	76	20	69	19	69	12	....
88	54	94	60	88	57	87	47	79	32	65	27	68	16	92
88	38	94	48	88	38	85	35	75	14	65	14	63	9	113
87	46	93	56	89	50	90	44	75	30	69	20	67	22	94
....	52	....	55	....	55	....	42	....	....	....	17	....	....	....
91	53	92	56	88	50	88	41	79	30	64	22	69	18	92
88	40	92	48	87	45	84	37	78	26	64	16	67	11	96
95	44	92	50	87	46	84	42	75	28	67	18	67	15	99
86	47	92	56	86	52	87	40	71	23	64	16	58	12	105
85	44	84	49	80	46	78	40	70	22	54	18	59	8	97
86	55	89	57	87	52	84	41	69	22	65	25	69	21	96
88	38	....	....	....	....	....	....	....	....	....	....	....	....	....
83	41	89	45	83	41	88	32	73	17	....	....	63	6	....
....	....	....	....	....	....	80	32	70	20	61	14	67	12	....
85	37	90	57	85	44	81	36	72	20	60	17	64	9	106
87	46	91	56	87	54	85	41	79	32	66	22	67	18	91
90	48	....	....	....	....	....	....	75	17	65	20	65	13	....
89	46	95	50	88	42	85	35	64	14	55	16	62	7	111
92	57	96	63	91	57	85	43	76	25	64	23	68	16	....
87	44	89	52	87	46	89	38	75	25	68	20	67	14	90
86	42	90	42	86	38	88	30	65	13	56	12	64	8	110
86	48	90	55	86	53	84	42	80	28	64	23	67	16	92
....	....	....	....	....	....	....	....	80	26	67	20	66	18	....
....	....	....	....	....	....	82	37	75	23	66	18	67	15	....
88	39	91	44	86	39	86	32	70	16	60	13	62	8	106
91	49	95	52	88	46	85	38	80	27	68	23	68	16	....
76	52	81	57	80	56	74	49	66	36	62	25	57	18	79
81	49	86	52	80	52	79	44	67	31	61	23	58	13	86
85	45	89	52	87	50	86	38	76	33	67	20	....	....	....
87	42	86	51	82	49	80	36	71	30	62	17	61	12	....
....	....	89	50	83	50	81	35	67	28	63	16	59	11	....
85	47	87	53	82	50	79	39	68	31	63	18	58	14	90
80	52	82	56	80	54	76	46	68	34	62	25	56	17	81
90	50	89	55	86	51	86	43	80	32	67	22	71	11	94
92	50	90	54	84	50	....	....	69	32	64	23	64	11	....
90	47	....	....	....	....	82	39	74	29	64	18	66	9	....
....	....	86	53	84	50	82	38	70	27	63	19	60	10	....
....	....	....	....	....	....	....	....	....	....	78	24	75	28	....
98	46	98	70	92	64	92	44	86	32	78	22	....	....	....
96	44	98	60	92	54	92	42	84	36	78	22	....	....	....
94	43	93	64	86	62	89	46	83	33	77	23	76	24	....
98	42	100	64	92	60	92	46	84	34	78	24	....	....	....
99	40	99	55	92	45	94	44	88	32	78	21	77	20	88
94	47	96	56	92	62	90	42	86	34	80	28	....	....	....
95	48	95	51	90	55	88	40	80	27	....	....	....	....	....
95	51	97	71	90	66	91	58	86	43	79	31	78	37	71
96	50	98	62	94	58	94	44	84	32	82	22	76	21	....

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
South Carolina—Continued.	°	°	°	°	°	°	°	°	°	°
Chester									101	38
Clinton	65	23	68	23	70	33	81	34	93	46
Columbia	70	24	69	17	77	28	88	38	98	41
Conway	70	29			73	30	86	45	95	50
Evergreen	67	18	61	10			85	39	94	38
Florence	65	30			70	38			98	43
Greenville									96	36
Greenwood									95	42
Hardeeville									98	42
Jacksonborough									97	40
Kingstree									98	40
Kirkwood		18		4		26		41		42
Port Royal									92	51
St. George's									98	35
St. Matthew's									97	40
Simpsonville										
Spartanburg	67	15			72	22			95	48
Statesburgh	65	26	69	19	75	30	85	39	95	44
Timmonsville	69	30	64	24	70	44	82	47	94	54
Trial			70	20	72	29	88	40	95	42
Walhalla										
Winnsborough	68	19	68	10	74	23	88	34	97	40
Yorkville	77	20	67	11	75	25	93	37	94	39
South Dakota:										
Alexandria										
Armour									89	39
Brookings	44	24	43	—30	68	4	83	12	91	20
Canton										
Clark										
De Smet				—23		10		30		39
Fort Bennett	44	—21	49	—27	75	10	87	24	87	24
Fort Meade	48	— 3	57	—20	68	5	72	20	79	29
Fort Randall	45	—15	53	—24	74	12	86	27	95	30
Fort Sisseton	34	—25	36	—30	69	— 3	78	17		
Fort Sully (1)	46	—14	53	—22	74	11	87	27	88	26
Fort Sully (2)	45	—19	47	—22	71	10	85	27	88	25
Garden City	36	—21	38	—29	65	2	79	21	89	32
Huron	42	—25	45	—30	70	8	84	21	90	22
Kimball		—18		—24	68	9	84	24	87	26
Onida					76	8	78	28	91	32
Parkston	50	—22	54	—28	70	10				
Rapid City	57	— 3	58	—17	69	10	80	21	82	31
Roscoe										*28
Spearfish	55	— 3	55	—16	68	9	78	33	85	34
Spring Lake	52	—14	48	—18	72	10	84	32	92	40
Webster	38	—26	41	—33	71	0	81	14	92	23
Woonsocket	45	—29	41	—30	73	8	88	18	92	22
Wolsey			41	—34	70	7	80	20	88	20
Yankton	47	—12	56	—18	72	13	81	27	94	30
Tennessee:										
Andersonville			60	9	78	26	83	31	90	32
Arlington									93	40
Ashwood	58	21	71	14	73	27	81	35	88	39
Austin	61	22	72	9	78	27	87	32	91	36
Bolivar (1)									91	37
Bolivar (2)										
Brownsville									93	40
Chattanooga	64	20	71	13	80	26	86	37	91	41

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
99	44	100	63	97	60	98	42	88	30	82	30	....	....	....
96	52	95	66	86	64	85	42	80	35	75	26	72	30	119
....	....	96	64	....	....	....	....	86	33	80	23	78	25	....
92	45	93	68	88	61	87	49	84	43	82	26	79	30	....
93	39	94	62	85	60	....	....	....	....	....	....	75	18	....
96	50	100	64	92	60	90	48	84	36	80	34	....	....	....
94	42	94	40	88	56	88	42	80	30	74	20	....	....	....
96	42	102	64	90	60	90	48	84	36	76	22	·76	26	....
98	46	98	70	94	64	92	48	88	34	82	24	....	....	....
99	44	98	64	90	58	92	44	86	28	82	22	....	....	....
96	46	96	62	92	56	92	42	84	40	80	30	....	....	....
....	53	....	65	....	61	....	45	....	32	....	21	....	22	....
89′	55	95	76	89	68	90	59	84	45	78	32	74	36	....
96	48	98	64	92	58	92	44	86	34	80	24	....	....	....
96	46	96	64	90	62	92	46	86	34	84	24	....	....	....
....	....	93	67	....	....	89	42	88	34	81	20	....	23	....
100	42	104	50	90	56	90	38	84	22	78	24	78	24	....
94	47	92	64	86	61	86	49	82	36	77	25	75	27	76
90	57	90	72	86	68	84	57	86	44	79	29	74	36	70
94	43	96	63	87	65	92	45	83	33	82	23	79	23	....
....	....	87	70	....	....	85	42	77	36	69	26	75	26	....
99	42	95	62	96	55	90	44	82	30	81	20	h77	h24	89
94	42	94	61	89	58	92	44	84	32	80	20	78	24	83
98	55	104	42	98	42	92	32	....	....	58	— 3	59	— 9	....
98	47	e98	52	97	52	....	....	....	....	....	....	....	....	....
94	36	98	37	97	42	89	30	76	24	60	— 6	58	—21	128
....	....	....	....	96	49	89	35	78	27	56	0	54	0	....
....	....	100	39	100	48	92	31	85	19	57	— 5	55	—16	....
....	54	....	59	....	62	....	35	....	28	....	— 5	....	— 6	....
100	42	108	46	108	47	100	32	89	19	64	— 7	54	—11	135
94	42	97	34	100	47	91	28	86	22	64	— 4	66	— 2	120
99	45	105	48	100	49	94	32	79	18	62	— 3	65	— 3	129
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
99	45	108	51	107	49	98	35	87	21	65	— 6	52	— 6	130
99	46	105	50	107	48	98	36	85	20	64	— 6	53	— 6	129
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
98	48	104	44	97	46	92	32	78	17	62	— 4	55	—12	134
99	41	....	47	99	48	90	34	77	19	56	— 4	....	— 5	....
99	40	100	48	108	42	100	34	82	22	60	— 9	54	4	....
94	40	....	....	....	....	....	....	....	....	....	....	66	— 2	....
95	43	100	46	100	49	94	30	86	25	72	0	61	— 2	117
e103	39	e106	42	k108	41	d91	26	d78	18	....	....	....	....	....
101	48	93	52	100	49	92	39	85	22	66	3	64	4	117
92	52	98	50	96	52	....	....	....	....	....	....	....	....	....
94	35	96	43	100	42	92	27	81	15	60	— 7	49	—21	133
99	39	104	41	99	41	94	28	77	14	62	— 4	59	—13	134
97	38	105	44	96	43	90	27	78	14	60	10	50	—15	....
93	44	98	50	96	51	88	34	80	22	60	0	60	3	116
85	46	89	57	85	51	86	41	80	28	67	21	72	20	....
94	43	96	60	94	58	92	46	82	30	76	22	....	....	....
87	45	90	62	88	63	87	41	80	30	72	25	72	25	76
90	48	92	62	88	58	90	40	82	28	78	20	78	22	83
92	45	95	60	94	56	94	42	86	32	74	20	....	....	....
93	61	96	69	96	66	95	49	85	45	....	....	78	33	....
96	40	98	62	94	62	92	52	84	44	78	26	....	....	....
87	39	92	63	91	57	89	40	82	35	73	23	73	25	79

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Tennessee—Continued.	°	°	°	°	°	°	°	°	°	°
Clarksville	60	19	69	11	76	25	86	33	90	37
Cog Hill	....	....	72	5	76	18	90	34	90	34
Covington (1)	62	21	70	18	76	29	77	41	87	47
Covington (2)	....	....	....	....	....	....	....	....	78	....
Cumberland Gap	....	....	....	....	....	....	80	32	69	31
Dunlap	....	....	....	....	....	....	....	....	....	....
Dyersburgh	....	....	....	....	....	....	....	....	95	36
Fayetteville	62	20	72	12	76	28	84	38	91	42
Florence Station	58	24	67	15	73	29	80	39	88	44
Fostoria	70	13	....	....	....	....	....	....	....	....
Grand Junction	....	....	....	....	....	....	....	....	87	39
Greeneville	61	18	63	9	72	26	80	33	81	34
Grief	....	....	....	....	....	....	....	....	....	....
Hohenwald	63	18	73	6	80	16	88	28	92	45
Jacksboro	60	18	60	8	74	25	81	32	86	34
Kingston Springs	65	17	63	7	79	21	85	31	91	33
Knoxville	65	20	64	12	77	26	83	32	91	36
Lawrenceburgh	57	16	68	6	77	17	80	28	89	32
Leeville	63	20	65	8	82	26	85	34	91	41
Lewisburgh	57	19	....	....	....	....	....	....	88	44
Lookout Mountain	54	15	65	10	74	22	80	34	84	38
Lynnville	....	....	....	....	....	....	....	....	....	....
McKenzie	64	21	74	16	78	30	....	....	....	....
McMinnville	....	....	....	....	....	....	83	39	89	43
Memphis	65	21	77	17	80	33	83	41	90	47
Milan (1)	65	20	73	14	78	25	83	35	92	39
Milan (2)	....	....	....	....	....	....	....	....	94	37
Nashville	61	20	70	12	78	26	85	33	91	40
Nunnelly	64	19	70	7	79	19	82	33	87	34
Parksville	60	19	70	11	77	23	82	35	89	39
Riddleton	70	20	70	8	77	21	84	32	89	36
Rogersville	60	20	60	8	70	28	79	30	88	30
Rugby	....	....	....	....	....	....	....	....	88	42
Savannah	64	26	72	22	....	....	83	37	89	40
Spring Dale	65	18	64	6	80	24	86	28	....	....
Trenton	62	20	72	14	75	25	80	36	87	38
Tullahoma	....	....	....	....	....	....	80	33	....	....
Watkins	59	21	72	10	80	30	82	35	92	39
Waynesborough	82?	21	72	18	82	21	84	32	86	35
Woodstock	....	....	....	....	....	....	87	45	89	48
Texas:										
Abilene	73	23	80	14	83	32	88	42	94	42
Austin (1)	75	26	79	26	85	41	89	47	90	46
Austin (2)	....	....	....	....	80	40	86	50	89	50
Baird	....	....	....	....	86	....	88	40	....	[e]38
Belton	74	25	77	21	....	....	88	46	91	45
Brady	76	22	78	18	81	35	90	42	89	38
Brazoria	70	30	74	35	78	40	84	48	86	51
Brenham	72	31	81	27	83	44	89	53	92	50
Brownsville	77	37	88	45	85	47	92	56	87	59
Brownwood	74	24	76	18	81	36	90	46	93	44
Camp Eagle Pass	88	20	86	33	....	....	98	50	98	46
Camp Pena Colorado	56	9	[1]67	[1]8	86	34	....	....	98	42
Cedar Hill	69	19	....	....	74	35	82	46	89	44
Cleburne	70	20	76	20	78	34	86	50	88	46
College Station	68	28	74	24	84	41	....	50	....	48
Colorado	....	....	54	14	....	....	[1]93	2	99	[d]41
Columbia Station	**72**	**32**	**75**	**35**	**78**	**45**	**85**	**50**	**91**	**57**

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
88	48	90	60	91	55	89	41	82	32	75	22	73	25	80
90	40	....	....	86	68	88	46	82	34	78	29	....	....	....
96	45	97	58	96	56	90	46	78	34	74	25	....	....	....
87	54	89	68	88	65	87	51	80	38	75	25	76	27	....
83	43	88	55	....	....	....	....	....	....	....	....	67	25	....
91	62	94	64	89	60	90	45	80	33	73	24	....	....	....
98	43	100	59	97	54	94	44	83	30	76	22	76	23	....
89	43	95	65	90	62	91	44	83	34	72	26	76	27	83
83	52	88	67	86	61	86	44	80	37	71	27	71	30	73
83	44	86	61	87	52	88	42	....	....	....	....	....	....	....
90	43	93	62	92	64	91	46	84	34	77	20	....	....	....
82	41	86	62	81	55	83	41	76	27	74	20	68	21	77
....	....	94	65	90	60	90	43	82	32	72	23	....	....	....
92	38	97	56	94	54	90	38	85	26	72	24	76	20	91
84	44	88	63	84	55	86	38	77	27	70	21	68	18	80
90	44	93	58	88	55	87	37	82	28	75	25	....	....	....
88	44	92	60	86	56	89	40	80	30	74	21	72	22	80
86	38	....	....	....	....	88	34	....	....	....	....	....	....	....
88	48	96	63	91	59	95	43	86	29	75	23	74	23	88
87	51	91	65	90	62	90	42	....	....	71	25	74	22	....
78	44	84	66	88	55	88	45	81	29	....	....	....	....	....
....	....	....	....	88	58	86	36	76	32	64	20	70	32	....
94	46	92	66	88	62	91	46	77	38	74	24	78	28	....
87	50	86	59	86	64	87	43	76	29	66	20	....	....	....
92	50	94	64	92	62	92	51	84	38	77	24	76	28	....
96	44	96	60	94	54	94	40	84	30	78	21	....	....	....
90	46	92	62	92	57	91	44	86	31	76	22	76	23	....
88	46	93	62	90	58	91	40	83	30	74	23	73	25	81
90	37	93	58	87	56	90	38	83	26	74	23	74	20	86
86	41	91	62	87	56	88	42	78	32	70	24	75	22	80
88	43	89	59	86	57	89	37	82	26	78	22	74	21	81
87	44	93	68	86	60	90	43	73	30	73	21	67	20	85
84	48	89	62	86	59	85	42	78	31	70	19	69	22	....
90	46	92	62	93	62	92	46	80	30	80	23	75	24	....
92	46	94	60	90	58	94	41	82	31	75	22	72	17	....
....	....	88	59	89	55	86	43	83	30	73	22	74	24	....
85	53	87	65	84	62	185	149	77	32	67	21	167	127	....
89	50	97	68	95	64	94	46	81	31	78	28	76	26	87
82	42	85	61	85	59	90	42	80	28	72	20	77	20	72
95	54	96	71	95	69	92	50	....	....	....	....	....	....	....
94	58	98	64	100	63	96	43	90	42	74	26	78	24	86
95	60	99	72	99	70	92	51	89	42	79	34	80	36	73
92	62	96	72	100	68	90	58	87	36	78	34	80	36	....
88	60	....	70	98	69	....	....	....	....	....	....	....	....	....
94	59	103	70	100	62	94	53	94	34	84	27	....	....	....
95	58	97	65	97	62	93	46	87	36	79	122	79	26	79
89	58	93	70	90	68	88	55	86	39	79	30	79	42	63
96	61	101	72	98	65	94	56	88	43	82	33	80	36	74
91	68	94	74	93	72	90	56	89	49	85	38	82	50	57
92	56	101	66	100	63	93	42	91	36	76	26	79	28	83
106	55	101	69	102	67	99	50	94	44	86	26	88	31	....
102	53	102	59	101	55	192	33	186	35	80	18	79	15	....
94	59	99	69	....	....	....	....	....	....	....	....	....	....	....
88	60	94	70	97	59	86	42	82	32	72	20	....	....	....
99	58	104	71	102	63	94	57	97	43	85	32	87	35	....
....	....	....	....	104	63	....	....	....	....	79	24	82	22	....
93	57	96	72	96	68	90	54	86	39	80	30	80	43	66

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°
Texas—Continued.										
Corpus Christi	73	34	76	42	81	45	83	58	84	56
Corsicana	75	24	77	19	87	36	92	47	94	43
Cuero	....	....	....	....	....	....	....	....	91	66
Dallas	....	....	....	....	....	....	....	....	90	44
Decatur	75	16	73	16	83	31	90	43	89	43
Duval	....	....	....	....	....	....	....	....	....	....
El Paso	67	20	72	18	85	29	93	40	97	45
Epworth	....	....	....	....	....	....	....	....	....	....
Forestburgh	....	....	....	....	....	36	....	52	....	58
Fort Bliss	67	20	76	18	85	31	95	38	98	45
Fort Brown	[c]76	[c]35	89	44	85	44	92	55	89	56
Fort Clark	70	11	84	25	84	28	95	34	94	48
Fort Concho	75	21	81	17	85	35	95	44	99	43
Fort Davis	62	11	68	23	78	28	86	36	93	40
Fort Elliott (1)	61	4	75	3	78	23	88	33	98	34
Fort Elliott (2)	60	15	75	1	80	21	88	35	98	35
Fort Hancock	77	10	83	10	89	18	97	32	101	31
Fort McIntosh	....	28	87	37	84	38	96	48	96	50
Fort Ringgold	92	25	95	38	88	38	101	51	100	55
Fort Worth	....	22	79	19	79	35	....	41	....	41
Fredericksburgh	....	....	....	....	....	....	....	....	87	49
Gainesville	....	....	75	14	....	....	....	....	91	40
Gallinas	82	22	85	31	86	37	90	45	92	43
Graham	....	....	....	....	....	....	....	....	....	....
Hartley	....	....	....	....	....	....	....	....	....	....
Hearne	....	....	....	....	....	....	....	....	88	45
Houston	70	27	77	30	....	....	88	58	90	48
Howe	....	....	....	....	78	32	88	44	88	45
Huntsville	69	26	80	28	80	40	....	....	90	48
La Grange	....	27	....	26	....	41	....	56	90	41
Lampasas	76	22	87	[e]24	[d]87	37	95	47	97	43
Longview	68	24	80	26	83	35	88	47	91	46
Luling	76	28	74	30	85	40	91	50	92	48
Menardville	....	....	....	....	....	....	....	....	[1]91	60
Merkel	....	....	....	....	....	....	....	44	....	53
Mesquite	74	18	78	18	88	34	90	48	92	43
New Braunfels	78	25	74	30	78	40	90	44	97	52
New Ulm	70	30	81	27	83	42	84	53	90	50
Palestine	70	25	80	24	82	38	87	50	88	48
Panhandle	....	....	....	....	....	....	....	....	....	....
Panter (Granbury)	75	24	76	20	86	30	88	49	89	53
Paris	....	....	....	....	....	....	....	....	88	39
Pecos City	....	....	....	....	85	33	94	46	102	44
Rio Grande City	88	30	92	40	84	44	96	54	96	59
Round Rock	....	....	....	....	....	....	....	....	....	....
San Antonio (1)	80	28	81	33	84	40	87	49	88	46
San Antonio (2)	80	29	81	33	84	40	87	49	98	48
Silver Falls	64	11	78	[h]8	89	28	[1]89	34	101	34
Snyder	....	....	55	11	....	34	....	44	....	41
Tyler	67	22	....	....	....	....	....	....	89	42
Waco	75	28	77	21	80	33	90	47	91	42
Weatherford	....	....	....	....	....	....	....	....	90	43
Utah:										
Beaver	....	....	....	....	....	....	....	....	88	36
Blue Creek	36	5	49	9	70	32	94	40	99	32
Corinne	46	−4	54	2	71	34	88	42	91	39
Fort Douglas	41	5	53	9	70	32	83	16?	85	29
Fort Du Chesne (1)	38	−21	45	−15	71	17	84	24	89	30

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
91	69	91	74	94	70	88	56	88	54	82	40	80	46	60
94	54	98	68	100	62	92	52	90	38	76	26	....	....	....
93	72	100	70	....	....	94	30†	90	34	88	30	....	....	....
94	60	100	70	98	64	94	50	92	38	78	22	84	30	....
91	56	98	64	98	62	94	46	88	39	79	24	80	24	82
96	60	104	76	102	70	94	52	89	42	80	32	82	31	....
104	54	104	65	103	63	100	42	89	39	76	26	76	19	86
....	....	....	....	....	....	89	52	88	50	74	26	75	25	....
....	68	....	72	....	70	....	64	....	54	....	32	....	32	....
105	53	107	65	105	62	101	41	90	39	76	24	78	20	89
93	65	95	71	95	70	92	55	91	51	83	37	85	50	....
103	60	98	65	100	65	96	46	90	40	89	34	94	37	92
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
96	50	95	55	96	60	90	33	84	50	78	20	80	17	85
99	43	106	51	100	58	95	41	95	35	82	18	82	11	103
96	49	108	52	100	60	92	41	94	35	81	17	81	13	107
108	42	111	54	110	52	97	23	89	28	80	13	80	16	101
104	59	104	67	105	62	97	49	91	44	81	32	83	35	77
108	62	110	70	109	65	99	49	99	42	91	29	90	43	85
91	59	[m]95	67	95	63	91	47	90	38	76	28	80	32	76
93	64	96	68	97	63	92	52	86	41	74	28	79	31	....
93	62	[c]96	[c]66	....	....	89	44	....	....	....	....	....	....	....
99	54	101	65	100	62	96	51	94	35	83	26	85	34	79
[b]93	[o]59	100	64	101	55	97	41	92	36	76	21	80	25	....
....	....	110	50	105	31	102	32	98	24	80	8	85	11	....
90	58	98	68	96	62	90	52	88	34	78	28	78	33	....
93	56	97	72	96	66	92	54	86	36	86	28	83	40	....
93	61	98	64	96	63	93	47	88	38	84	22	78	26	....
76	57	99	71	98	63	98	51	90	37	81	30	80	36	....
....	60	....	69	91	60	....	52	....	34	....	28	....	46	....
91	55	98	69	97	66	[d]91	50	91	36	78	26	79	28	76
94	62	100	70	98	60	96	52	88	34	80	26	80	32	76
96	60	100	70	98	66	94	54	90	40	78	30	....	....	....
101	64	....	....	96	63	93	50	88	43	76	27	77	27	....
....	60	....	61	....	72	....	44	....	45	....	....	....	24	....
99	62	99	66	100	61	94	44	88	36	78	24	81	29	82
100	54	101	69	100	67	90	54	88	40	84	30	79	37	76
93	60	97	70	96	67	92	54	92	43	84	31	80	37	70
91	55	99	70	99	65	90	53	89	38	77	28	80	31	75
....	....	....	....	101	65	95	36	[k]91	35	73	16	[o]77	12	....
91	62	....	....	98	72	96	50	87	48	76	31	81	31	....
94	42	100	66	'98	64	96	50	88	36	....	....	78	28	....
104	55	104	59	104	63	90	55	86	40	63	26	....	....	....
104	66	104	75	106	69	98	54	94	46	89	33	88	46	76
....	....	....	....	....	....	96	56	92	32	....	28	84	32	....
95	58	98	68	95	67	92	52	91	42	79	31	82	35	70
104	57	106	67	106	56	100	30†	100	34	85	25	84	35	81
[l]91	[k]53	104	56	102	57	96	38	94	38	82	19	84	14	96
....	....	....	63	....	70	....	52	....	44	....	....	....	....	....
96	56	100	68	98	60	94	50	88	32	82	26	78	43	....
96	58	100	70	100	64	94	50	94	36	82	28	78	31	79
94	55	100	64	100	58	....	....	....	....	....	....	....	....	....
....	42	97	42	92	44	87	27	88	22	65	12	55	6	....
99	61	109	68	104	53	93	45	82	32	59	23	49	15	104
97	52	105	62	103	52	90	38	85	32	52	22	58	5	109
96	50	102	48	98	46	87	32	89	28	59	[h]24	57	11	97
96	37	103	44	100	41	90	28	85	22	55	6	50	4	124

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Utah—Continued.	°	°	°	°	°	°	°	°	°	°
Fort Du Chesne (2)	38	—22	45	—17	71	15	84	23	90	30
Kelton	45	—12	56	0	73	32	88	34	92	33
Losee	....	....	....	....	....	....	....	....	90	38
Moab	....	....	....	....	....	....	....	....	....	....
Mount Carmel	....	....	....	....	....	....	....	....	....	....
Mount Pleasant	....	....	....	....	....	....	....	....	....	....
Nephi	....	....	....	....	....	....	....	....	93	29
Ogden (1)	44	— 4	54	10	74	30	82	33	96	35
Promontory	42	— 2	60	4	70	22	82	30	84	30
Richfield	....	....	....	....	....	....	....	....	....	....
St. George	....	....	....	....	....	....	....	....	....	....
Salt Lake City	44	5	51	8	68	32	84	32	87	34
Taylor's Ranch	60	8	65	— 2	....	....	....	....	....	....
Terrace	39	—10	50	0	68	35	80	35	90	40
Vermont:										
Brattleboro (1)	54	— 3	43	—18	63	10	82	23	93	30
Brattleboro (2)	54	1	44	—14	62	13	83	26	92	32
Burlington	56	0	45	—15	52	13	78	25	90	37
Chelsea	44	— 8	42	—21	53	10	70	24	82	36
Coventry	49	10	....	....	52	4	72	19	94	29
East Berkshire	54	—15	56	—35	54	2	80	18	94	29
Hartland	....	....	....	....	....	....	....	....	....	....
Jacksonville	52	— 2	52	—30	59	6	81	18	92	27
Lunenburgh	58	0	50	—26	72	8	78	18	95	32
Manchester	54	2	....	....	....	....	....	....	90	38
Northfield	57	—10	48	—32	55	8	76	18	90	31
St. Johnsbury	52	—14	42	—31	52	— 2	75	18	92	31
Saxton's River	52	—11	47	—28	61	4	81	19	92	31
Strafford	50	4	40	—20	54	10	74	24	90	36
Vernon	52	— 6	44	—20	62	14	78	28	94	32
Virginia:										
Alum Springs	....	....	....	....	....	....	82	28	89	38
Birdsnest	64	24	53	8	66	29	86	33	89	50
Bolar	....	....	....	....	....	....	76	24	87	30
Cape Henry	67	29	71	16	70	31	88	33	97	47
Christiansburgh	57	14	....	....	63	22	79	26	83	31
Dale Enterprise	65	10	67	1	72	26	88	22	98	32
Fort Monroe	64	23	63	15	70	31	81	35	92	44
Fort Myer	65	18	52	2	70	26	83	30	94	38
Lexington	....	....	....	....	....	....	....	....	....	....
Lynchburgh	69	18	66	7	77	28	89	28	95	35
Marion	60	10	62	6	[a]72	[a]22	80	24	88	28
Middletown	....	....	....	....	....	....	....	....	....	....
Mossingford	....	....	....	....	....	....	....	....	....	....
Norfolk	67	24	71	16	70	29	89	36	93	46
Nottaway C. H	....	....	....	....	....	....	....	....	....	....
Petersburgh	65	21	62	10	65	29	81	33	89	41
Richmond	....	....	....	....	....	....	....	....	....	....
Smithfield	68	21	60	10	74	28	90	35	87	41
Spottsville	66	20	60	10	72	30	88	32	94	41
Summit	....	....	54	2	67	21	83	30	88	34
Wytheville	58	18	61	10	73	24	....	....	97	33
Washington:										
Blakeley	50	25	60	23	67	32	77	35	80	38
Fort Canby (1)	....	....	....	....	....	....	....	....	....	....
Fort Canby (2)	57	32	58	30	70	41	65	41	78	43
Fort Spokane	40	— 8	55	0	70	23	83	29	89	36
Fort Townsend	51	25	60	24	65	32	72	35	78	40

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
97	35	103	42	101	39	91	27	85	20	55	4	50	3	125
99	61	110	65	106	60	87	44	86	31	56	16	56	—4	122
96	50	102	59	98	56	89	38	85	29	58	10	58	4	....
....	....	....	....	....	....	....	....	91	28	71	9	....	....	....
....	....	88	51	87	52	86	32	86	31	....	14	....	18	....
....	....	....	....	m75	m38	69	25	72	27	47	8	43	5	....
102	32	106	39	106	42	91	25	89	25	55	14	55	12	....
98	45	98	62	100	50	82	32	....	....	56	20	54	18	....
90	48	100	55	108	52	88	40	84	30	60	18	56	0	110
....	....	....	....	96	42	87	26	85	26	62	7	57	10	....
107	58	115	66	111	63	102	46	99	34	72	25	68	22	....
97	47	102	52	98	45	84	35	86	30	61	26	57	11	97
....	....	99	46	100	41	88	30	88	23	53	4	48	—3	....
90	65	104	67	102	60	85	48	75	40	70	22	55	0	114
89	41	88	47	85	46	84	32	71	19	61	12	62	2	111
85	43	84	50	81	47	82	33	70	21	61	16	....	....	....
82	44	88	52	83	48	82	38	60	22	59	20	55	0	105
77	44	76	54	76	48	75	35	57	16	54	11	50	—7	103
92	44	....	....	....	....	....	....	....	....	....	....	....	....	....
88	36	92	42	86	39	88	27	62	12	56	12	52	—7	129
....	....	....	....	....	....	84	35	69	13	59	12	56	—8	....
88	35	88	42	88	39	84	29	67	13	60	13	56	—2	122
95	37	92	50	94	48	83	32	68	15	68	0	50	—15	121
86	48	86	54	86	50	82	42	64	23	62	16	56	0	....
85	34	85	43	83	40	83	30	63	12	58	12	55	—12	122
89	36	82	44	80	43	80	31	60	13	60	10	50	—10	123
....	....	....	....	....	....	....	....	70	13	63	11	....	....	....
86	42	82	54	82	46	80	34	60	22	54	16	50	—8	110
96	48	94	56	82	52	82	36	68	22	64	10	58	0	116
86	50	88	60	....	....	....	....	....	....	....	....	....	....	....
90	59	90	67	89	62	87	48	83	41	73	31	73	27	82
90	34	87	50	81	46	80	32	78	22	64	16	61	12	....
91	58	94	64	92	59	92	50	81	40	79	32	74	30	81
86	38	92	54	83	49	84	33	76	30	73	19	67	18	....
96	42	103	54	85	34	87	38	80	26	75	19	72	19	102
92	54	92	65	90	63	86	42	78	38	74	29	69	29	77
92	47	95	55	90	53	86	40	80	32	70	25	71	20	93
90	42	92	49	87	48	86	32	79	26	74	21	72	15	....
92	45	96	59	89	53	87	42	81	33	73	24	73	21	89
....	....	....	....	....	....	....	....	....	....	72	19	67	13	....
....	....	....	....	91	52	88	40	76	33	67	20	72	17	....
....	....	....	....	85	58	....	....	....	36	....	27	....	20	....
94	55	98	63	90	61	88	46	81	40	78	27	74	28	82
....	....	....	....	....	....	92	36	82	30	80	18	76	15	....
90	51	90	60	89	58	84	43	79	35	73	24	73	23	80
....	....	....	....	....	....	89	41	87	31	74	22	76	21	....
88	50	90	61	86	57	85	43	82	35	76	28	74	24	80
98	48	96	58	92	55	90	42	80	32	74	25	72	21	88
90	42	90	52	86	50	85	34	78	27	70	24	69	15	....
89	39	79	49	78	43	67	26	....	....	....	....	....	....	....
83	42	91	45	87	44	80	36	70	38	62	32	52	24	68
....	....	....	....	80	47	90	40	72	46	69	38	56	32	....
83	49	80	50	72	50	86	46	70	44	66	38	56	31	53
95	41	102	41	94	39	91	25	86	31	57	22	45	—3	110
82	41	88	44	76	42	78	35	68	36	60	31	49	24	64

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Washington—Continued.	°	°	°	°	°	°	°	°	°	°
Fort Walla Walla	49	8	64	18	72	30	84	34	93	40
Neah Bay	57	28	55	24	62	36	67	36	72	38
Olympia	50	22	62	20	73	31	79	31	89	35
Port Angeles	50	26	54	29	59	30	64	32	72	38
Pysht	48	26	56	26	61	32	64	32	72	36
Spokane Falls	40	2	53	6	72	25	79	31	86	38
Vancouver Barracks	55	19	63	20	72	28	80	31	86	41
Vashon	....	....	60	23	70	34	80	34	83	39
Walla Walla	52	11	63	19	72	32	84	36	91	42
West Virginia:										
Clarksburgh	60	8	57	8	64	17	....	....	....	....
Ella	....	....	....	....	....	....	....	....	....	44
Kingwood	....	....	....	....	....	....	....	....	82	42
Parkersburgh (1)	58	17	59	5	73	22	83	24	89	31
Parkersburgh (2)	60	17	61	4	74	24	85	23	91	32
Pleasant Hill	....	....	....	....	....	....	....	....	84	40
Rivesville	....	....	....	....	....	....	....	....	93	45
Rowlesburgh	....	....	....	....	....	....	....	....	....	....
Seven Pines	....	....	....	....	....	....	....	....	87	42
Tannery	....	....	....	....	....	....	....	....	....	....
Tyler Creek	67	20	54	5	75	30	85	31	96	32
Wisconsin:										
Cadiz	....	—10	....	—12	....	20	....	30	....	38
Delevan	46	— 8	41	—18	69	13	78	23	89	32
Embarrass	44	—10	40	—36	65	12	80	24	85	38
Fond du Lac	43	— 5	....	....	64	16	75	23	84	26
Fredonia	43	— 2	38	—18	64	23	69	28	82	34
Friendship	....	....	....	....	....	....	....	22	....	34
Glasgow	....	....	....	—21	....	23	62	28	....	34
Grantsburgh	....	....	....	....	....	....	78	24	83	28
Green Bay	43	— 2	35	—24	61	16	74	23	82	30
Greenwood	....	....	....	....	....	....	....	....	80	25
Hayward	....	....	....	....	62	— 2	78	20	84	33
Honey Creek	....	....	....	....	....	....	....	....	....	....
Horicon	....	....	....	....	....	....	....	....	....	....
La Crosse	45	— 7	43	—23	67	19	81	24	83	34
Lincoln	....	8	....	....	....	20	....	29	....	38
Madison	42	— 2	37	—20	65	19	72	26	82	34
Manitowoc	45	3	44	—21	63	17	77	22	76	28
Milwaukee	50	3	40	—16	63	20	74	28	84	33
Millsville	....	....	....	....	66	10	....	....	....	....
Oshkosh	43	— 4	34	—24	61	16	77	22	85	30
Richland Centre	....	....	....	....	....	24	....	30	....	42
Summit Lake	....	....	....	....	76	10	80	16	82	32
Viroqua	....	....	....	....	....	15	....	18	....	30
Waucousta	....	— 3	....	—22	....	11	....	20	....	26
Wausau	....	....	....	....	....	....	....	....	....	....
Wauzeka	....	....	....	....	....	....	....	....	....	....
Weston	....	—10	....	—27	....	18	....	26	....	34
Wyoming:										
Cheyenne	51	0	54	—16	62	15	72	22	78	24
Fort Bridger	40	—24	51	—18	62	10	74	20	....	20
Fort D. A. Russell	53	— 5	49	—23	57	7	73	17	81	20
Fort Laramie	54	—38	56	—21	72	14	82	24	88	....
Fort McKinney (1)	47	2	58	—13	63	12	72	29	81	20
Fort McKinney (2)	52	— 6	58	—14	64	12	72	28	77	30
Fort Washakie (1)	44	—16	47	—21	63	7	74	22	81	27
Fort Washakie (2)	43	—19	51	—24	65	8	74	20	78	23

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Range.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
99	45	102	48	97	45	90	34	79	35	63	23	51	8	94
74	40	72	44	73	44	68	39	67	39	60	32	58	26	50
90	40	90	42	81	42	85	34	74	37	60	29	51	21	70
76	37	83	41	70	42	72	32	64	32	60	30	48	28	57
76	40	79	42	75	44	74	36	64	37	59	31	.....	.....	....
91	40	96	44	90	41	86	26	86	31	53	22	42	—10	106
88	50	95	52	85	41	90	34	75	37	67	28	53	20	76
90	47	92	48	82	48	88	42	74	43	65	38	.....	.....	....
100	47	100	50	95	48	88	38	80	37	62	25	54	9	91
.....	.....	.....	.....	81	46	°86	°30	.....	.....	.....	.....	.....	.....	....
.....	48	91	59	80	55	83	40	70	29	66	22	66	20	....
89	44	90	51	92	47	93	36	73	26	70	10	62	20	....
87	42	94	54	89	48	89	35	77	24	76	23	69	16	90
84	44	90	50	82	44	84	38	78	24	80	10	62	10	....
91	48	98	57	92	52	.....	.....	.....	.....	.....	.....	.....	.....	....
.....	47	.....	57	.....	54	.....	.....	.....	26	.....	17	.....	19	....
90	50	94	52	88	48	89	34	74	22	70	18	63	12	....
.....	50	94	60	75	50	.....	.....	75	28	66	14	70	6	....
89	41	98	60	88	60	86	40	76	31	73	21	79	20	93
.....	46	.....	58	.....	50	.....	30	.....	24	.....	10	.....	.....	....
.....	.....	.....	.....	.....	.....	.....	.....	73	21	51	2	58	10	....
88	46	93	56	88	55	86	35	75	25	58	4	48	2	129
85	37	90	48	91	44	88	28	72	19	54	0	57	8	....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....
.....	48	.....	52	.....	48	.....	32	.....	22	.....	.....	.....	.....	....
.....	48	84	59	79	57	.....	35	.....	24	.....	.....	.....	13	....
90	39	92	51	86	38	86	31	77	21	56	—3	46	—13	....
85	40	90	50	90	43	86	23	65	26	54	6	50	6	114
89	36	92	37	86	32	86	21	70	16	56	—5	48	—5	....
95	49	105	51	102	54	88	40	74	28	.....	.....	.....	.....	....
.....	.....	.....	.....	93	52	90	38	78	32	54	2	58	10	....
.....	.....	.....	.....	.....	.....	.....	.....	.....	18	.....	1	.....	10	....
88	42	92	49	91	46	90	30	79	24	57	5	61	7	115
.....	41	.....	58	.....	55	.....	42	.....	34	.....	22	.....	24	....
83	42	92	55	90	51	90	35	76	29	51	9	60	12	112
80	36	90	48	90	45	80	31	62	26	57	6	60	8	111
83	42	90	54	90	51	83	34	74	31	53	12	60	14	106
96	32	104	54	98	52	96	22	78	14	54	—4	48	—2	....
88	40	.....	.....	.....	.....	.....	.....	.....	.....	54	10	56	8	....
77	47	.....	61	.....	56	.....	38	79	14	66	2	61	5	....
92	34	95	50	94	42	90	30	86	18	80	4	58	—12	....
.....	40	.....	54	.....	50	.....	28	.....	23	.....	14	.....	4	....
.....	38	74	45	.....	.....	.....	.....	.....	20	.....	—2	.....	6	....
89	41	.....	55	89	38	88	24	77	11	56	0	49	2	....
.....	.....	.....	.....	102	56	100	30	88	28	62	10	.....	.....	....
.....	46	94	42	.....	52	.....	.....	.....	.....	.....	.....	.....	.....	....
87	31	95	38	92	42	87	28	81	22	61	1	60	6	111
.....	23	95	36	93	29	84	24	80	20	54	—6	47	—19	....
92	28	100	30	98	34	92	22	94	15	62	—8	64	—4	123
98	39	106	38	102	38	97	29	91	21	61	—3	70	—2	127
95	37	93	42	93	40	83	31	83	14	64	12	58	3	108
93	36	95	41	93	37	84	31	84	21	68	10	59	3	109
90	33	93	41	92	36	80	27	81	23	54	6	53	—8	114
90	32	94	41	93	36	79	27	82	23	56	4	52	—10	118

TABLE OF MAXIMUM AND MINIMUM TEMPERATURES AND

Stations.	January.		February.		March.		April.		May.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°
Wyoming—Continued.										
Lusk	.....	.....	55	—14	65	13	73	22	78	22
Pilot Butte, Camp	35	—30	49	—15	66	9	79	9	83	22
Rawlins	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Saratoga	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sheridan, Camp	38	— 7	47	—15	57	12	69	19	77	21
Wheatland	40	.....	40	.....	48	.....	59	.....	72	.....

ANNUAL RANGE OF TEMPERATURES FOR 1889, ETC.—Continued.

June.		July.		August.		September.		October.		November.		December.		Range.
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
95	37	98	40	94	38	87	27	80	21	58	— 4	58	— 8	....
93	30	97	44	97	42	85	24	83	11	48	—11	47	—15	127
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....
.....	.....	.....	.....	.....	.....	(*)	(*)	78	20	58	— 6	56	—20	....
87	33	91	32	91	36	79	23	79	18	50	4	42	— 5	106
81	.....	84	.....	85	.....	62	.....	70	.....	.....	.....	46	.....	....

* Only 6 days.

APPENDIX 13.

PRECIPITATION DATA, 1889, FROM REGULAR AND VOLUNTARY OBSERVERS.

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, COMPILED FROM THE REPORTS OF REGULAR SIGNAL SERVICE OBSERVERS, VOLUNTARY AND STATE WEATHER SERVICE OBSERVERS, UNITED STATES POST SURGEONS, OBSERVERS OF THE NEW ENGLAND METEOROLOGICAL SOCIETY, AND OPERATORS AND AGENTS OF THE PACIFIC RAILWAY SYSTEM.

[NOTE.—Letters of the alphabet denote number of days missing from the record; thus "c" denotes that three days are missing. Interpolated values, derived from data for adjacent stations, are given in brackets.]

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Alabama:	o	o	o	o	o	o	o	o	o	o	o	o	o
Auburn	9.12	5.72	2.81	3.04	1.52	2.71	3.75	3.73	3.42	1.52	6.26	0.68	44.28
Bermuda	7.80	4.91	2.09	1.21	?0.05	1.34	4.07	0.24	3.14	0.03	6.20	0.06	31.14
Butler	3.64	1.73	[3.00]	3.93	[0.50]	3.23	6.78	4.75	2.78	[0 30]	5.74	1.55	[37.93]
Citronelle	7.13	3.34	2.79	3.91	2.32	1.06	8.34	2.08	7.97	[0.10]	*q*0.63	1.06	[40.73]
Columbiana	[6.50]	[4.80]	[3.00]	3.91	0.80	6.20	5.03	3.83	4.84	2.12	6.33	2.14	[49.50]
Decatur (1)	4 45	4.35	2.70	1.55	2.00	3.12	12.63	3.88	9.23	0.66	4.15	1.10	49.82
Decatur (2)	....	....	....	....	1.16	3.35	10.63	4.91	8.86	1.00	4.88	0.73	....
Elkmont	[4.80]	4.37	2.95	1.40	2.42	8.91	8.51	2.50	8.83	1.50	7.90	1.10	[55.19]
Eufaula	....	....	....	....	1.15	3.14	6.24	1.97	2.38	2.30	7.47	....	....
Evergreen	....	....	....	....	....	6.24	4.00	2.05	4.32	1.40	8.57	0.71	....
Fayette C. H	....	....	....	....	....	7.50	8.10	4.10	3.80	1.00	3.50	1.20	....
Florence	3.41	4.37	2.79	1.49	2.43	4.35	....	5.01	....	....	....	....	....
Fort Deposit	....	....	....	....	1.33	3.31	7.22	5.03	4.43	1.54	6.52	....	....
Gadsden	6.35	6.39	3.95	2.90	1.60	....	....	....	....	....	2.75	1.07	....
Greensborough	5.40	2.06	1.52	6.62	0.61	3.37	4.52	2.98	1.91	0.37	4.13	2.19	35.68
Livingston (1)	4.47	2.41	2.08	4.03	0.69	6.42	6.80	2.35	1.22	0.19	4.67	4.05	39.38
Livingston (2)	....	....	....	....	0.34	4.62	6.27	1.67	0.57	0.30	2.38	....	....
Marion	....	....	....	....	0.37	4.63	7.84	2.28	2.57	1.36	4.16	....	....
Mobile	5.07	4.64	3.48	1.65	2.98	5.35	9.55	2.80	6.97	0.08	6.78	0.53	49.88
Montgomery	6.70	3.49	2.95	3.13	1.28	4.02	5.70	6.33	4.35	1.01	6.17	0.49	45.62
Motes	6.82	6.72	4.22	1.70	4.11	5.93	8.66	2.00	6.38	[0.20]	[4.40]	[1.00]	[52.14]
Mount Vernon Barracks	7.09	2.62	3.14	2.47	2.62	1.98	7.91	1.13	6.36	0.23	6.89	1.63	44.07
Mount Willing	....	....	2.65	5.22	1.05	....	8.45	....	4.21	1.00	....	....	....
New Market	5.78	3.99	3.87	4.57	4.64	5.49	8.54	....	....	....	....	....	....
Opelika	....	....	....	....	1.40	4.34	4.63	2.03	2.66	0.59	4.09	....	....

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Alabama—Continued.													
Pine Apple	......	......	......	......	?0.30	6.90	?0.19	?0.23	?0.67	0.10	5.60	?0.02	......
Selma (1)	......	......	......	......	1.03	4.75	4.80	7.45	6.00	0.60	5.80	......	......
Selma (2)	......	......	......	......	......	......	......	......	......	......	......	......	......
Talladega	7.45	4.90	2.97	4.50	1.90	7.52	1.65	......	......	......	......	......	......
Troy	8.24	3.30	......	g3.74	1.42	......	......	......	......	......	......	......	......
Tuscaloosa	6.11	2.59	3.12	5.99	2.22	5.36	7.08	3.03	1.89	[1.00]	[4.20]	[2.30]	[44.89]
Tuscumbia (1)	......	......	......	......	a1.50	5.45	6.17	1.99	3.69	0.10	5.45	......	......
Tuscumbia (2)	5.33	4.50	3.03	1.70	2.48	6.04	8.13	2.17	5.32	0.17	4.06	0.95	43.88
Union Springs	8.39	3.62	2.18	4.27	1.23	3.42	2.46	3.01	2.53	0.27	6.83	[0.50]	[38.71]
Uniontown	5.07	2.06	2.43	5.25	0.10	3.57	8.73	3.19	2.30	0.35	6.21	1.02	40.28
Valley Head	5.82	7.14	3.50	2.85	3.44	5.05	2.86	3.45	6.44	1.33	7.02	1.42	50.32
Wiggins	[6.00]	[4.40]	3.41	2.69	1.57	4.04	7.41	1.01	4.39	0.45	[6.60]	0.57	[42.54]
Alaska:													
Killisnoo	4.45	3.35	3.45	3.40	2.95	1.85	1.85	6.40	5.75	4.70	4.75	2.40	45.30
Arizona:													
American Flag	......	......	......	......	......	......	0.44	3.16	3.15	0.50	0.80	0.28	......
Antelope Valley	1.93	0.64	3.14	0.00	0.00	0.00	1.67	2.29	[1.80]	2.35	0.13	5.86	[19.81]
Arizona Canal Co.'s Dam	......	......	......	......	......	......	......	1.70	1.00	0.12	0.08	3.80	......
Ash Cañon	1.80	......	......	......	......	0.26	4.42	0.20	4.35	2.30	......	......	......
Ash Creek	......	......	......	......	......	......	......	0.47	0.65	1.89	0.60	10.22	......
Ash Springs	......	......	......	......	......	......	......	......	11.25	0.63	0.15	1.13	......
Banghart's	......	......	......	......	......	......	5.50	2.40	0.40	0.90	......	4.35	......
Benson	0.93	0.07	0.63	0.00	0.00	0.63	2.16	0.94	1.04	0.05	0.00	1.33	7.78
Bisbee	......	......	......	......	......	......	......	0.73	3.79	0.38	0.20	0.29	......
Buckeye	......	......	......	......	......	......	......	0.51	0.20	0.96	0.36	3.93	......
Calabasas	......	......	......	......	......	0.13	3.40	2.48	2.51	......	0.00	0.83	......
Casa Grande	[1.10]	0.00	0.50	0.10	0.00	0.00	0.00	0.00	0.50	0.80	0.10	1.25	[4.35]
Cedar Springs	2.16	1.27	1.40	0.22	0.00	0.47	2.60	3.60	[0.70]	[1.00]	0.22	[1.10]	[14.74]
Chiri Cahua Mountains	......	......	......	......	......	......	......	......	9.40	1.42	0.00	1.55	......
Chloride	......	......	......	......	......	......	0.14	......	0.60	0.85	0.19	7.53	......
Cooley's Springs	......	......	......	......	......	......	2.74	2.95	1.46	0.12	2.85	4.20	......
Cottonwood	......	......	......	......	......	......	3.70	1.10	0.40	0.22	0.12	......	......
Crittenden	......	......	......	......	......	......	2.17	2.32	1.70	0.30	0.00	......	......

Dos Cabezos	....	....	....	....	....	....	....	....	*0.58*	*1.11*	*T.*	*0.12*	....
Dudleyville	....	....	....	....	....	....	*2.46*	*2.50*	*1.55*	*0.78*	*0.82*	*1.88*	....
Duncan	....	....	....	....	....	....	*1.40*	*1.02*	*1.27*	*0.20*	*0.23*	*0.75*	....
Eagle Pass (Curtis)	*1.84*	*1.80*	*1.01*	*0.05*	*T.*	*0.04*	*2.53*	*5.42*	*2.10*	*1.15*	*0.38*	*1.69*	18.01
Flagstaff	[0.60]	[1.00]	[0.80]	0.75	0.65	0.30	5.00	0.65	1.19	1.69	0.50	7.87	[21.00]
Florence	1.26	0.84	2.83	0.13	0.00	4.35	0.00	0.53	0.34	0.44	0.47	2.06	13.25
Fort Apache (1)	2.24	0.88	1.85	0.47	0.00	0.11	2.67	2.87	1.02	0.46	0.55	3.98	17.10
Fort Apache (2)	1.33	0.89	1.78	0.30	0.00	0.10	2.68	2.62	0.89	0.56	0.80	1.95	13.90
Fort Bowie (1)	1.38	1.62	1.58	T.	0.09	0.09	2.65	0.20	3.37	0.74	T.	0.51	12.23
Fort Bowie (2)	[1.38]	1.47	1.48	0.22	0.09	0.04	2.48	0.36	2.79	0.74	0.00	0.51	[11.56]
Fort Grant	1.99	1.28	1.04	0.13	T.	1.06	3.57	1.35	0.69	0.94	0.16	1.11	13.32
Fort Huachuca	1.90	1.55	2.71	0.22	0.00	0.16	3.66	1.80	2.46	0.04	0.14	0.75	15.39
Fort Lowell	2.09	0.76	2.46	0.30	0.00	0.45	3.36	2.07	3.32	0.34	0.19	1.58	16.92
Fort McDowell (1)	2.85	0.77	0.14	0.09	0.00	0.06	0.62	0.29	0.61	1.31	0.73	5.31	12.78
Fort McDowell (2)	2.66	0.53	1.35	0.09	0.00	0.06	0.64	0.29	0.60	1.17	0.81	5.47	13.67
Fort Mojave	4.15	0.35	2.50	0.71	0.26	T.	T.	0.74	0.00	0.65	0.85	11.17	21.38
Fort Thomas	1.47	1.35	0.96	0.10	0.00	T.	3.45	1.40	0.38	0.26	0.34	1.18	10.89
Fort Verde (1)	1.95	0.25	1.66	*0.00*	*0.00*	*0.02*	*3.10*	0.75	1.60	1.74	0.08	5.08	16.23
Fort Verde (2)	2.90	0.25	0.65	T.	T.	T.	3.40	0.75	0.69	1.75	0.05	5.62	16.06
Gila Bend	....	....	....	....	....	....	0.36	1.03	*0.00*	*1.50*	*0.00*	2.80	....
Gillette	....	....	....	....	....	....	1.62	1.05	0.00	1.90	0.00	6.15	....
Globe	2.15	1.11	2.33	0.43	0.00	0.38	1.36	1.19	5.90	1.94	[0.50]	[3.10]	[20.39]
Grand Central Mill	....	....	....	....	....	....	5.19	2.57	1.07	0.14	0.00	0.35	....
Holbrook	0.30	0.29	0.82	0.10	0.09	0.20	2.06	1.20	0.67	0.49	0.50	0.91	7.63
Huachuca, Mount	2.37	0.34	2.61	0.14	T.	0.55	5.44	0.54	3.04	0.63	T.	0.21	15.87
Lochiel	1.90	[0.20]	1.91	[0.20]	[0.00]	1.55	3.77	1.67	2.17	0.55	0.00	0.65	[14.57]
Maricopa	0.85	0.15	1.19	0.00	0.00	0.00	0.55	0.90	0.90	1.20	0.83	[4.00]	[10.57]
Mesa City	....	....	....	....	....	....	0.41	....	0.65	0.85	0.75	....	....
New River	....	....	....	0.00	T.	T.	....	1.31	0.05	1.70	....	....	....
Oro (Clifton)	....	....	....	....	....	....	....	....	1.71	1.22	0.66	0.55	....
Pantano	1.59	0.65	2.08	0.88	0.00	1.14	3.22	2.42	2.52	0.04	0.00	0.96	15.50
Payson	....	....	....	....	....	....	2.40	0.50	1.15	1.90	....	8.43	....
Peoria	1.56	0.24	1.00	0.01	T.	T.	1.75	2.80	0.90	1.33	0.47	3.73	13.79
Phœnix	....	....	....	....	0.00	0.12	0.66	1.77	0.39	0.99	0.77	3.38	....
Red Rock	....	....	....	....	....	....	2.54	1.99	1.04	0.00	0.55	1.05	....
St. John's	....	....	....	....	....	....	3.60	0.70	0.85	T.	0.15	0.05	....
San Carlos (1)	1.62	1.33	2.15	0.25	0.00	T.	1.83	0.87	2.05	0.60	0.40	2.30	13.40
San Carlos (2)	1.62	1.00	2.37	0.30	0.00	*m*0.06	1.67	0.65	2.13	0.71	0.50	2.05	13.06
Show Low (Cooley's)	....	....	....	....	....	....	....	0.60	1.15	0.42	0.65	2.25	....
Signal	....	....	....	....	T.	*e*0.06	T.	0.98	0.42	0.56	T.	5.63	....

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Arizona—Continued.	o	o	o	o	o	o	o	o	o	o	o	o	o
Silver King							1.88	2.78	0.97	1.17	0.83	5.22	
Stanton							1.26	3.73	1.32	1.42		6.60	
Strawberry					0.00	0.20	2.10	1.41	3.50	2.74	0.20	12.38	
Teviston	1.20	0.80	0.80	0.20	0.00	3.80	1.80	0.10	2.30	0.60	0.20	0.20	12.00
Texas Hill	2.65	0.00	0.12	0.00	0.00	0.00	T.	0.00	0.00	0.10	0.05	0.62	3.54
Tip Top							2.50	1.17	0.26	2.97	0.00	8.63	
Tombstone				0.00			3.59	2.03			T.		
Tres Alamos							2.84	2.02	2.84	0.46	0.01	0.72	
Tucson (1)	1.74	1.06	1.93	0.18	T.	0.30	5.66	2.06	3.12	0.36	0.32	1.59	18.37
Tucson (2)	[1.74]	1.50	1.20	0.70	0.00	0.05	0.00	1.00	3.00	[0.36]	0.42	1.57	[11.54]
Volunteer Springs				0.00	0.90	0.72	2.50	0.70					
Walnut Grove					0.00	T.	2.10	1.65	0.06		1.00	7.55	
Whipple Barracks	1.73	1.35	2.91	0.19	T.	0.02	1.45	1.51	2.11	1.76	0.42	7.38	20.83
Wilcox (1)	1.31	0.90	1.06	0.04	0.00	0.13	4.91	0.97	2.91	0.83	T.	0.62	13.68
Wilcox (2)	1.15	[0.20]	1.95	[0.05]	0.00	0.07	3.62	1.01	2.79	0.80	0.02	0.50	[12.16]
Williams	0.70	1.70	0.95	0.05	T.	T.	1.45	4.00	4.13	0.30	[0.20]	1.80	[15.28]
Willow Springs	2.04	[0.60]	5.77	[0.20]	0.00	0.20	3.06	2.41	0.92	[0.40]	1.15	3.67	[20.42]
Winslow	[0.50]	0.60	0.60	0.02	0.00	0.85	0.55	1.10	0.31	0.42	0.00	0.87	[5.82]
Wood Cañon									1.41	0.70	0.39	1.00	
Woodruff								0.28	0.81	0.20	1.00	1.00	
Yuma (1)	1.12	0.06	0.24	0.00	0.00	T.	T.	0.25	0.00	0.59	T.	2.43	4.69
Yuma (2)	1.12	0.00	0.15	[0.00]	[0.00]	0.00	0.00	0.06	0.00	0.06	T.	2.22	[3.61]
Arkansas:													
Alexander	7.77	1.40	6.30	6.54	2.95								
Arkansas City	5.04	2.33	3.08	2.47	2.82	6.28	5.57	1.86	2.07	0.52	5.56	0.58	38.18
Brinkley					0.05	1.54	0.18		0.36				
Camden	8.57	1.53	4.95	5.39	3.12	4.04	4.15	1.51	6.84	0.98	9.18	0.10	50.36
Conway	5.84	2.05	6.65	2.06	4.11	9.48	4.07	2.12	4.78	1.05	13.17	0.65	56.03
Dallas	8.12	2.10	6.00	2.75	3.31	4.60	[5.20]	T.	[6.10]	[0.90]	4.12	[0.20]	[43.40]
Dardanelle	[4.00]	1.75	3.20	2.00	3.30	5.85	9.04	2.85	4.20	1.85	9.87	[0.30]	[48.21]
Dayton	4.40	2.20	3.80	2.60	4.67	2.76	3.16	2.02	[6.00]	[0.70]	2.00	[1.00]	[35.31]
Devall's Bluff					1.49	4.90	5.75	4.60	3.30	0.09	1.34	0.00	
El Dorado	7.00	5.80	4.75	[5.80]	0.91	7.25	5.27	1.11	1.83	0.46	7.48	0.46	[48.12]

Eureka Springs	*3.85*	*4.70*	......	......	......	*8.90*	*6.61*	......	......	......	......	......	......
Forrest City	*6.26*	*5.05*	*4.00*	*4.12*	*2.17*	*6.53*	*3.41*	*3.45*	*2.82*	*0.65*	*6.29*	*0.40*	*45.15*
Fort Smith	*5.33*	*1.95*	*4.53*	*1.83*	*4.70*	*5.37*	*4.64*	*1.14*	*5.35*	*0.70*	*5.93*	*1.43*	*43.20*
Fulton	*4.46*	1.78	4.71	3.81	1.74	5.95	2.98	[1.20]	5.22	1.30	6.25	0.00	[39.40]
Heber	6.75	1.02	8.28	0.50	2.75	2.76	2.10	1.88	[5.00]	3.25	16.25	0.26	[50.80]
Helena (1)	5.66	2.32	3.80	3.90	1.78	7.23	3.87	2.14	3.78	0.53	5.85	0.19	41.05
Helena (2)	3.80	2.00	3.00	3.90	1.02	3.83	3.06	2.50	3.50	0.00	[5.85]	[0.19]	[32.65]
Hot Springs	4.40	2.99	4.29	3.95	4.39	9.16	5.48	2.05	6.50	1.35	5.83	0.40	50.79
Lead Hill	3.78	2.87	3.61	1.57	5.32	4.70	2.80	4.65	4.33	3.88	5.10	1.15	43.76
Little Rock	7.30	1.48	6.17	4.28	2.97	3.07	7.59	3.06	5.96	1.99	10.20	0.14	54.21
Little Rock Barracks	7.30	0.54	6.06	4.48	2.97	3.06	3.30	2.66	6.86	2.36	11.26	0.00	50.85
Lonoke	7.50	1.75	7.30	2.62	2.75	5.75	3.62	3.37	3.25	1.50	9.60	0.00	49.01
Malvern	......	......	......	......	......	2.07	3.26	2.00	......	3.64	12.34	1.76	......
Monticello	......	......	......	......	g1.50	3.30	4.35	1.88	2.40	0.52	8.07	0.96	......
Newport (1)	6.15	1.15	6.58	4.11	2.40	2.50	4.50	5.55	4.84	2.43	10.17	0.56	50.94
Newport (2)	[6.50]	[1.10]	[6.40]	3.30	2.49	3.75	4.63	2.22	5.14	1.12	13.30	[0.50]	[50.45]
Osceola	[5.00]	[1.80]	6.06	1.48	1.73	6.20	4.84	2.64	3.80	0.96	7.69	0.25	......
Ozone	5.76	3.31	3.13	1.96	3.42	4.05	9.50	3.29	8.08	5.19	1.34	0.56	49.59
Pine Bluff	......	......	......	......	......	4.99	6.27	2.06	0.21	0.55	6.95	0.00	......
Prescott	......	......	......	......	d0.52	e0.49	4.10	0.23	0.38	0.14	0.41	......	......
Russellville	[4.00]	1.30	6.40	2.00	3.50	6.40	12.00	3.30	6.14	0.14	0.41	[0.40]	[45.99]
Stuttgart	1.42	2.39	5.25	4.07	1.36	8.35	5.09	1.80	1.94	0.99	7.80	0.28	40.74
Texarkana	4.11	1.14	2.62	[4.10]	2.47	6.28	5.10	0.08	4.08	1.01	8.03	0.00	[39.02]
Washington	8.48	3.25	4.94	2.92	1.96	6.32	4.98	1.30	3.53	1.83	7.68	0.19	47.38
Winslow	......	......	......	......	......	......	6.49	1.41	7.15	4.57	5.84	0.47	......
California:													
Alcade	0.50	0.40	4.12	1.40	0.62	0.00	0.00	0.00	0.00	4.95	1.50	12.50	25.99
Alcatraz Island	0.54	0.50	9.08	0.53	2.30	T.	0.00	0.00	0.00	7.81	3.45	13.04	37.25
Almaden	0.55	0.69	6.20	0.79	2.01	0.00	0.00	0.00	0.00	5.66	2.73	14.11	32.74
American Hill	......	......	......	......	......	0.40	0.00	0.00	0.00	11.20	9.10	21.22	......
Anaheim	0.14	1.28	7.97	0.24	0.57	0.00	0.00	T.	0.76	2.31	0.30	10.95	24.52
Anderson	0.44	1.72	12.00	4.09	5.99	1.73	0.00	0.00	0.00	12.32	5.38	18.24	61.91
Angel Island	1.68	0.91	6.64	1.08	2.45	0.06	0.00	0.00	0.00	7.86	3.40	11.28	35.36
Antioch	0.95	0.52	4.81	0.46	1.07	T.	0.00	[0.00]	[0.00]	4.51	2.09	6.54	[20.95]
Aptos	0.50	0 87	5.90	0.85	1.71	0.00	0.00	0.00	0.00	7.49	2.33	18.29	37.94
Arcata	4.38	1.70	5.75	3.85	7.23	0.52	[0.20]	[0.00]	[0.30]	8.27	3.61	12.57	[48.38]
Athlone	0.36	0.39	2.48	0.77	0.93	0.20	0.00	[0.00]	0.00	3.59	2.36	5.74	[16.82]
Auburn	0.33	0.52	9.57	1.36	4.65	0.00	0.00	0.00	0.00	5.75	4.85	11.94	38.97
Bakersfield	0.57	0.20	1.88	0.15	0.22	0.00	0.00	0.00	0.00	2.04	0.22	1.75	7.03
Barstow	0.14	0.04	0.93	0.00	0.12	0.00	0.00	0.13	0.07	0.23	0.70	3.87	6.23
Beaumont	1.15	1.95	5.27	0.61	0.29	0.00	0.00	0.00	0.00	1.56	0.67	11.09	22.59

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
California—Continued.	o	o	o	o	o	o	o	o	o	o	o	o	o
Benicia Barracks	0.94	0.34	5.53	0.88	2.01	T.	0.00	0.00	0.00	5.07	3.11	11.18	29.06
Berendo	[0.65]	[0.30]	3.02	1.71	1.41	0.00	0.00	0.00	0.00	3.67	2.26	4.66	[17.68]
Berkeley	0.78	0.54	7.58	0.72	1.50	0.06	0.00	0.00	0.00	5.80	2.39	12.59	31.96
Bishop Creek	0.10	[0.20]	1.46	0.12	0.30	0.00	0.00	0.00	0.00	[0.70]	[1.50]	1.20	[5.58]
Boca	[0.10]	[0.20]	1.15	0.10	3.90	0.00	0.00	0.00	[0.00]	1.50	4.55	19.85	[31.35]
Borden	0.15	0.44	1.79	0.77	0.94	0.00	0.00	0.00	0.00	3.42	1.69	3.05	12.25
Boulder Creek	1.24	1.80	19.58	0.39	4.78	0.00	0.00	0.00	0.00	19.68	9.56	38.93	95.96
Brentwood	0.48	0.72	4.57	0.62	0.87	0.13	0.00	0.00	0.00	4.66	3.44	9.61	25.10
Brighton	0 00	0.46	5.46	0.11	2.85	0.22	0.00	0.00	0.00	6.04	3.60	6.19	24.93
Byron	?0.71	0.72	4.24	0.49	0.98	0.12	0.00	0.00	0.00	4.52	2.86	8.33	22.97
Cactus	[0.85]	[0.10]	[0.90]	0.00	0.00	0.00	0.00	0.25	0.10	0.70	?0.00	2.02	[4.92]
Caliente	0.59	0.20	3.15	0.60	0.00	0.00	0.00	0.00	0.00	1.35	1.05	3.65	10.59
Calistoga	0.96	0.72	10.87	1.23	3.91	0.09	0.00	0.00	0.00	9.85	4.10	17.67	49.31
Campo	[1.30]	4.65	4.00	[0.20]	0.45	0.10	[T.]	2.50	0.50	1.10	1.67	9.34	[25.81]
Castroville	0.69	1.59	4.18	1.00	1.20	0.05	0.00	0.00	0.00	4.31	2.03	11.81	26.86
Cedarville	......	......	......	......	1.38	0.46	T.	0.00	0.00	......	......	......	......
Centreville	0.55	0.42	5.59	0.95	1.59	0.01	0.00	0.00	0.00	4.30	3.44	12.13	28.98
Chico	0.34	0.50	5.68	0.97	1.78	0.42	0.00	0.00	0.00	7.80	2.59	9.74	29.82
Cisco	1.40	[0.50]	2.70	1.65	8.10	0.47	0.00	0.00	0.00	11.72	9.54	25.57	[61.65]
Colegrove	0.10	1.10	5.97	0.26	0.69	0.00	0.00	0.50	T.	7.76	1.62	15.40	33.40
Coles	......	0.15	2.20	0.96	2.74	0.10	......	......	......	......	......	......	......
Colfax	0.50	0.90	13.90	3.00	9.14	0.25	0.00	0.00	0.00	9.95	9.60	21.85	69.09
Colton	0.86	0.88	4.47	1.02	0.60	0.00	0.00	T.	0.04	1.59	1.26	7.41	18.13
Colusa	0.30	0.43	5.36	0.33	0.72	0.37	0.00	0.00	0.00	6.35	2.64	7.75	24.25
Corning	0.27	0.76	4.37	0.55	1.38	0.65	0.00	0.00	0.00	5.74	3.26	10.11	27.09
Crescent City	6.11	2.69	10.85	5.75	10.91	0.72	0.14	0.10	1.52	13.76	7.12	20.58	80.25
Davis	0.20	0.41	6.62	1.17	1.48	0.34	0.00	0.00	0.00	8.14	3.04	9.02	30.42
Delano	0.63	0.05	2.10	0.22	0.16	0.00	0.00	0.00	0.00	2.46	0.56	1.93	8.11
Delta	0.15	1.02	37.52	2.91	5.81	1.07	0.00	0.00	0.00	26.71	10.03	25.83	111.05
Downey	0.60	0.73	4.74	0.48	0.32	0.00	0.00	[0.00]	0.84	3.66	1.33	10.44	[23.14]
Dunnigan	0.27	0.60	6.17	1.49	1.46	0.28	0.00	0.00	0.00	6.39	3.59	9.66	29.91
Dunsmuir	0.30	0.33	4.39	2.43	7.06	1.12	0.00	0.00	0.00	20.15	11.65	20.57	68.00
Edgwood	0.30	0.10	8.43	0.69	2.30	0.11	0.33	0.00	0.00	7.80	2.35	[12.00]	[34.41]

El Dorado	*0.31*	*0.38*	*8.41*	*1.60*	*7.50*	*0.12*	*0.00*	*0.00*	*0.00*	*7.46*	*6.32*	*14.94*	*47.04*
Elmira	*0.32*	*0.88*	*6.32*	*0.59*	*1.67*	*0.15*	*0.00*	*0.00*	*0.00*	*6.54*	*0.20*	*9.96*	*26.63*
El Verano	*1.16*	*0.68*	*10.69*	*0.96*	*3.38*	*0.17*	*0.00*	*0.00*	*0.00*	*9.73*	*5.70*	*14.85*	*47.32*
Emigrant Gap	[0.20]	[0.40]	5.69	2.29	8.61	0.38	0.00	0.00	0.00	11.81	11.41	20.85	[61.64]
Esperanza	0.35	0.78	5.70	0.66	1.47	0.18	0.00	0.00	0.00	6.14	3.79	9.41	28.48
Eureka	4.25	1.93	5.91	3.49	7.20	0.37	0.15	0.13	0.32	8.36	3.71	12.88	48.79
Evergreen	0.56	0.68	5.26	1.06	1.01	0.01	0.00	0.00	0.00	3.07	2.40	9.88	23.93
Farmington	0.30	0.70	3.07	0.20	1.88	T.	0.00	0.00	0.00	2.82	3.22	8.00	20.19
Felton	1.16	1.98	13.48	1.10	4.28	0.00	0.00	0.00	0.00	16.91	5.68	34.95	79.54
Florence	0.37	0.79	4.52	0.02	0.17	0.00	0.00	0.89	0.00	4.04	0.47	13.14	24.41
Folsom	0.32	0.57	7.57	0.39	3.29	0.23	0.00	0.00	0.00	6.18	4.18	11.25	33.98
Fort Bidwell	2.81	0.20	7.31	1.08	1.62	0.78	0.00	0.00	0.00	3.61	2.20	3.78	23.39
Fort Gaston	8.57	2.32	9.48	2.90	6.06	0.04	0.00	0.00	T.	7.31	6.24	13.94	[56.86]
Fort Mason	1.11	0.76	6.93	0.67	1.98	0.02	0.00	0.00	0.00	7.04	2.64	14.08	35.23
Fort Ross	0.97	1.77	8.35	1.54	3.17	0.20	0.00	0.00	0.12	10.92	4.02	13.07	44.13
Fresno (1)	0.37	[0.30]	2.55	0.77	0.60	0.00	0.00	0.00	0.00	3.10	1.43	3.80	[12.92]
Fresno (2)	0.34	0.32	2.07	0.54	0.57	0.00	0.00	T.	0.00	3.17	1.39	3.87	12.27
Fruto	0.82	1.42	6.38	0.92	1.33	0.40	0.00	0.00	0.00	8.81	2.92	10.38	33.38
Galt	0.20	0.48	5.36	0.05	2.04	0.08	0.00	0.00	0.00	5.46	3.77	7.64	25.08
Georgetown	0.66	0.68	12.29	2.77	7.07	0.25	0.00	0.00	0.00	10.45	1.23	22.94	58.34
Gilroy	0.46	1.00	4.22	0.63	2.00	0.00	0.00	0.00	0.00	5.36	2.98	10.21	26.86
Girard	0.05	1.00	3.24	0.49	1.97	0.00	0.00	0.36	0.40	1.97	0.80	4.69	14.97
Glen Ellen	1.56	0.97	16.00	1.27	5.84	0.16	0.00	0.00	0.00	11.26	6.20	19.25	62.51
Goshen	0.36	0.22	1.49	0.28	1.15	0.00	0.00	0.00	0.00	4.76	0.45	2.83	11.54
Grass Valley (1)	0.58	0.97	11.93	3.56	7.36	0.00	0.00	0.00	0.00	12.00	8.37	19.23	64.00
Grass Valley (2)	0.64	1.08	12.95	3.87	7.21	0.40	0.00	0.00	0.00	12.49	8.76	21.08	68.48
Hanford	0.31	0.35	1.65	0.63	......	......	......	......	......	......	......	......	......
Hollister	0.88	0.87	3.06	0.81	1.26	0.00	0.00	0.00	0.00	2.91	2.09	7.35	19.23
Hornbrook	10.60	0.10	2.07	0.43	2.34	0.00	0.00	0.00	0.00	1.95	2.93	2.92	13.34
Hydesville	4.55	2.31	8.91	[3.00]	5.83	0.40	0.15	0.20	0.35	7.92	4.47	12.66	[50.75]
Indio	0.57	[2.00]	1.05	0.00	0.00	0.00	0.00	0.95	0.00	0.60	0.01	3.29	[8.47]
Ione	0.12	0.30	5.33	0.25	2.58	T.	0.00	0.00	0.00	4.71	3.15	6.41	22.85
Iowa Hill	0.58	0.71	12.12	4.20	8.26	0.22	0.00	0.00	0.00	9.20	8.49	21.04	64.82
Jolon	1.26	1.40	9.65	0.59	1.12	0.00	0.00	0.00	0.00	7.38	4.09	11.42	36.91
Julian	......	......	......	......	......	......	0.00	0.60	0.00	3.34	0.93	13.76	......
Keeler	0.04	T.	0.52	0.12	0.06	0.01	0.00	T.	0.08	0.56	0.05	0.56	2.00
Keene	0.36	[1.00]	3.74	0.95	1.77	0.00	0.00	0.28	0.42	2.23	1.30	5.17	[17.22]
King City	0.92	1.33	6.13	0.29	0.48	0.00	0.00	0.00	0.00	4.17	2.74	8.07	24.13
Kingsburgh	0.29	0.35	2.28	0.47	0.72	0.00	0.00	0.00	0.00	3.73	0.98	3.64	12.46
Knight's Landing	[0.10]	0.28	6.53	0.42	2.17	0.41	0.00	0.00	0.00	5.28	3.93	8.78	[27.90]
La Grange	0.17	0.61	4.24	0.58	1.64	T.	0.00	T.	[0.06]	4.00	4.59	7.64	[23.47]

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
California—Continued.													
Lathrop	0.32	0.48	2.68	0.33	0.85	0.00	0.00	0.00	0.00	2.59	2.51	7.60	17.36
Laurel	0.62	1.47	17.77	1.39	4.44	0.00	0.00	0.00	0.00	20.48	6.18	31.79	84.14
Lemoore	0.27	0.20	2.09	1.70	0.13	0.00	0.00	0.00	0.00	3.39	1.06	2.87	11.71
Lewis Creek	1.00	0.39	2.45	0.41	1.36	0.05	0.00	T.	0.00	4.54	0.73	4.42	15.35
Livermore	0.46	0.67	5.15	0.51	2.25	T.	0.00	0.00	0.00	3.94	2.95	8.63	24.56
Livingston	0.27	0.40	2.67	0.10	1.60	0.00	0.00	0.00	0.00	2.74	3.20	5.68	16.66
Lodi	0.35	0.65	5.07	0.20	2.57	0.11	0.00	0.00	0.00	5.62	4.71	7.70	26.98
Long Beach						0.00	0.00	0.00	0.00	0.00			
Los Angeles (1)	0.25	0.92	6.48	0.27	0.65	0.01	T.	0.28	0.34	6.96	1.35	15.80	33.31
Los Angeles (2)	0.22	0.95	6.82	0.25	0.57	0.00	0.00	0.00	0.00	7.34	0.85	[15.80]	[32.80]
Los Banos	0.27	0.76	1.77	0.22	0.64	T.	0.00	0.00	[0.00]	0.86	2.43	5.54	[12.49]
Los Gatos (1)	0.76									11.89	4.75	20.73	
Los Gatos (2)	0.66	0.45	10.61	0.74	2.35	0.00	0.00	0.00	0.00	10.85	4.33	19.94	49.93
Mammoth Tank	0.62	0.03	1.37	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.11	3.18	5.48
Martinez	1.05	0.85	6.38	0.60	1.95	[0.00]	0.00	0.00	0.00	6.12	2.66	11.80	[31.41]
Marysville (1)	[0.10]	0.35	7.53	1.00	2.35	0.50	0.00	0.00	0.00	5.87	3.73	9.01	[30.44]
Marysville (2)	0.13	0.36	8.25	1.18	2.31	0.44	0.00	0.00	0.00	6.39	3.81	9.26	32.13
Mendocino									0.44	9.05	3.45	17.21	
Menlo Park	0.65	0.54	5.75	0.69	1.08	0.00	0.00	0.00	0.00	4.96	2.38	10.85	26.90
Merced	0.45	0.15	1.21	0.20	0.77	0.00	0.00	0.00	0.00	1.61	2.80	5.59	12.78
Modesto	0.45	0.20	1.80	0.19	1.20	0.00	0.00	0.00	0.00	1.79	2.22	5.31	13.16
Mojave	0.35	[0.90]	3.43	0.00	T.	0.00	0.00	0.81	0.27	2.21	0.45	7.30	[15.72]
Montague	[0.40]	0.04	1.78	0.55	1.70	0.60	0.00	0.00	0.00	3.20	1.60	3.74	[13.61]
Monterey	0.81	0.94	3.58	1.15	1.22	0.00	0.00	0.00	0.00	4.28	1.62	11.54	25.14
Monterey (Hotel del Monte)						0.00	0.00	0.00	0.00				
Mount Hamilton	1.04	1.42	6.17	1.92	3.21	0.05	0.00	0.00	0.00	4.38	4.46	13.19	35.84
Napa	0.87	0.98	8.87	0.52	2.17	0.00	0.00	0.00	0.00	5.32	3.88	12.23	34.84
National City (Sweetwater Dam)							0.01	0.09	0.00	2.60	1.08	8.13	
Needles	3.36	0.07					0.08	1.27		0.25		3.30	
Newark	0.42	0.47	5.82	0.72	1.32	0.02	0.00	0.00	0.00	4.40	2.78	11.96	27.91
Newhall	0.35	[0.80]	9.39	0.40	0.56	0.00	0.00	0.36	0.00	[2.50]	3.36	15.70	[33.42]
Newman	0.51	0.61	3.67	0.25	0.99	0.00	0.00	0.00	0.00	4.28	4.27	5.52	20.13

Niles	*0.46*	*0.37*	*6.00*	*0.82*	*2.10*	*0.00*	*0.00*	*0.00*	*0.00*	*0.48*	*3.46*	*12.41*	*26.10*
Norwalk	*0.22*	*1.19*	*4.29*	*0.27*	*0.20*	*0.00*	*0.00*	*0.00*	*0.00*	*2.61*	*1.47*	*9.71*	*19.96*
Oakland (1)	*0.90*	*0.63*	*7.60*	*0.93*	*1.92*	*0.07*	*0.00*	*0.00*	*0.00*	*7.30*	*2.89*	*13.38*	*35.62*
Oakland (2)	1.15	0.76	8.26	0.71	1.62	0.00	0.00	0.00	0.00	7.20	2.78	12.36	34.84
Ontario	[0.70]	1.06	9.80	0.39	1.10	0.00	0.00	0.00	0.00	2.72	[0.70]	12.54	[29.01]
Orland	0.22	0.58	4.52	1.02	1.37	0.38	0.00	0.00	0.00	7.96	2.20	6.80	25.05
Oroville	0.16	0.57	8.98	1.61	3.07	0.42	0.00	0.00	0.00	7.41	4.89	13.50	40.61
Pajaro	0.56	0.76	4.80	0.87	1.89	0.00	0.00	0.00	0.00	5.61	2.67	14.12	31.28
Paso Robles	0.78	0.98	5.55	0.45	1.25	0.00	0.00	0.00	0.00	5.61	[4.00]	9.13	[27.75]
Petaluma	0.71	0.72	7.36	1.34	2.68	0.18	0.00	0.00	0.00	9.33	4.17	10.12	36.61
Placerville (1)	0.55	0.90	9.89	1.99	8.88	0.12	0.00	0.00	0.00	8.85	8.20	19.07	58.45
Placerville (2)	1.03	0.86	9.78	1.93	8.05	0.16	0.00	T.	0.00	9.07	7.77	18.18	56.83
Pleasanton	0.60	0.48	4.55	0.62	1.36	0.00	0.00	0.00	0.00	3.63	[1.00]	10.34	[22.58]
Point Reyes Light	[1.20]	[0.70]	6.06	1.40	3.30	0.51	0.67	0.42	0.38	8.21	4.89	9.39	[37.13]
Pomona	0.51	5.12	8.62	0.57	0.70	0.00	0.00	0.00	0.00	3.73	0.80	11.53	31.58
Portersville	0.82	0.18	1.26	0.42	0.89	T.	0.00	T.	0.00	3.41	0.45	3.23	10.66
Puente	0.04	0.94	6.25	0.95	0.40	0.00	0.00	0.50	0.00	3.10	0.40	15.26	27.84
Red Bluff (1)	0.51	0.71	6.83	1.11	2.04	0.64	0.00	0.00	0.00	8.41	3.37	9.25	32.87
Red Bluff (2)	0.23	0.57	6.05	0.69	2.09	0.62	0.00	0.00	0.00	8.39	2.99	9.80	31.43
Redding	[0.50]	0.09	10.78	2.33	3.90	0.96	0.00	0.00	0.00	15.13	5.07	17.66	[56.42]
Riverside	0.72	1.16	4.48	1.09	0.30	0.00	0.00	T.	0.09	1.28	2.04	6.87	18.03
Rocklin	0.07	0.03	7.48	0.64	2.25	0.25	0.00	0.00	0.00	4.97	3.68	7.52	26.89
Rumsey	0.95	1.35	8.20	1.40	2.45	0.15	0.00	0.00	0.00	7.90	4.13	12.07	38.60
Sacramento (1)	0.15	0.33	6.25	0.26	3.25	0.25	0.00	0.00	0.00	6.02	3.15	7.82	27.48
Sacramento (2)	0.19	0.42	7.20	0.30	3.65	0.28	0.00	0.00	0.00	7.01	3.49	8.59	31.13
Sacramento (3)	0.06	0.25	5.65	0.15	2.69	0.23	0.00	0.00	0.00	5.62	2.47	6.37	23.49
Salinas (1)	0.65	1.65	3.33	0.95	0.68	0.00	0.00	0.00	0.00	4.20	2.41	8.72	22.59
Salinas (2)	0.77	1.64	3.04	0.82	0.79	0.00	0.00	0.00	0.00	3.42	2.32	6.91	19.71
Salton	[0.50]	5.12	1.21	0.00	0.00	0.00	0.00	0.30	0.00	0.15	0.13	3.79	[11.20]
San Ardo	0.83	0.80	6.16	0.49	0.27	0.00	0.00	0.00	0.00	4.74	2.96	7.16	23.41
San Bernardino	0.93	1.50	6.55	2.05	1.13	0.00	0.17	0.63	0.11	2.30	2.23	10.85	28.45
San Diego	1.72	1.80	2.20	0.19	0.03	0.10	T.	0.04	T.	2.12	0.12	7.71	16.03
San Diego Barracks	1.68	1.25	2.13	0.17	....	0.15	0.00	0.04	0.00	1.35	0.15	7.38	....
San Francisco	1.28	0.72	7.78	0.96	2.17	0.03	0.01	T.	T.	7.28	2.90	13.81	36.94
San Francisco (Presidio of)	1.18	0.75	7.80	0.45	0.70	0.00	0.00	0.00	0.05	6.87	3.19	13.97	34.96
San Fernando	0.09	0.63	8.95	0.56	0.43	0.00	0.00	0.06	0.32	6.17	1.60	14.40	33.21
San Gabriel	0.08	1.12	6.16	0.40	0.75	0.00	0.00	0.89	0.00	6.14	0.40	14.32	30.26
Sanger Junction	0.47	0.54	2.94	0.84	0.80	0.00	0.00	T.	0.00	4.39	1.31	4.71	16.00
San José	0.50	0.70	5.80	0.79	0.96	0.04	0.00	0.00	0.00	4.48	1.73	10.55	25.55
San Luis Obispo (1)	0.50	2.08	6.99	0.61	1.78	0.00	0.00	....	....	....	....	....	....
San Luis Obispo (2)	1.50	2.08	7.51	0.61	0.00	0.00	0.00	0.00	0.00	9.19	2.46	11.37	34.72

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
California—Continued.													
San Mateo	1.17	0.75	6.94	0.84	1.08	0.00	0.00	0.00	0.00	5.98	4.01	12.44	33.21
San Miguel	0.80	0.85	4.10	0.32	0.67	0.00	0.00	0.00	0.00	3.90	1.60	6.72	18.96
San Pedro	0.75	0.86	4.20	0.00	0.00	0.00	0.00	0.00	0.00	3.56	[1.10]	7.39	[17.86]
Santa Ana	0.31	2.07	4.65	0.66	0.45	0.00	0.00	0.66	0.00	1.88	0.36	12.09	23.13
Santa Barbara (1)	0.30	1.38	8.58	0.53	0.80	0.00	0.00	0.00	0.00	10.50	2.85	10.33	35.27
Santa Barbara (2)	0.29	1.29	7.31	0.49	0.76	0.13	0.00	0.00	0.00	8.65	3.21	10.64	32.77
Santa Clara	0.58	0.48	5.82	0.74	0.91	0.01	0.00	0.00	0.00	4.88	2.01	10.78	26.21
Santa Cruz	0.99	1.37	6.76	0.84	1.78	0.00	0.00	0.00	0.00	9.50	[4.00]	20.38	[45.62]
Santa Margarita	[1.50]	0.11	8.87	0.03	2.14	0.00	0.00	0.00	0.00	10.85	3.20	15.68	[42.38]
Santa Maria	0.42	1.35	4.20	0.97	0.60	0.05	0.00	0.00	0.00	7.53	1.80	6.71	23.63
Santa Monica	0.23	1.03	5.74	0.00	0.16	0.00	0.00	0.11	0.33	5.87	1.18	[15.00]	[29.65]
Santa Paula	0.65	1.02	9.00	0.36	0.30	0.00	0.00	0.01	0.00	6.28	1.71	16.45	35.88
Santa Rosa	1.77	0.35	7.92	1.09	2.93	0.25	0.00	0.00	0.00	8.78	4.39	15.94	43.42
Scott Valley	2.71	0.50	4.35	2.56	4.71	0.19	1.11	0.00	0.00	3.95	3.37	12.84	36.29
Selma	0.36	0.53	1.85	0.47	0.70	[0.00]	0.00	0.00	0.00	3.60	1.09	3.98	[12.58]
Seven Palms	0.30	0.06	1.54	0.00	0.01	0.00	0.00	0.07	0.00	0.53	[0.80]	4.64	[7.95]
Shingle Springs	[0.20]	[0.50]	9.01	1.98	7.80	0.00	0.00	0.00	0.00	8.73	7.85	17.35	[53.42]
Sims	0.42	[0.50]	[11.00]	1.87	3.55	2.73	0.00	0.00	0.00	28.57	13.32	19.65	[81.81]
Sisson	0.60	0.40	16.27	0.63	2.40	0.23	0.00	0.00	0.00	16.45	5.80	16.13	58.91
Soledad	0.69	1.75	3.35	0.30	0.58	0.00	0.00	0.00	0.00	3.00	[3.50]	8.94	[22.11]
Sonoma	0.90	0.79	....	....	....	....	....	....	....	9.09	4.36	11.47	....
South Side	0.70	0.42	4.93	0.32	0.38	0.00	0.00	0.38	0.42	2.18	1.20	10.78	21.71
South Vallejo	0.88	0.66	6.19	0.73	2.10	0.00	0.00	0.00	0.00	4.85	2.15	9.60	27.16
Spadra	0.15	[1.00]	4.97	0.47	0.61	0.00	0.00	0.00	0.00	3.64	1.23	7.69	[19.76]
Steele's	0.54	[1.30]	[5.30]	1.02	1.77	[0.00]	0.00	[0.00]	[0.00]	9.10	2.22	11.60	[32.85]
Stockton (1)	[0.30]	0.98	3.98	0.24	1.52	[0.20]	[0.00]	[0.00]	[0.00]	3.39	3.27	6.60	[20.48]
Stockton (2)	0.25	0.87	3.58	0.19	1.74	[0.20]	[0.00]	0.00	0.00	0.98	3.29	6.67	[17.77]
Suisun	0.50	0.85	5.65	0.43	1.47	0.00	0.00	0.00	0.00	6.47	3.27	10.18	28.82
Sutter Creek	0.22	0.87	4.60	0.79	3.68	0.05	0.00	0.00	0.00	7.63	3.99	11.75	33.58
Summit	1.00	1.50	9.55	1.90	6.30	0.22	0.00	0.00	0.00	5.65	6.80	18.50	51.42
Susanville	0.03	0.60	4.81	1.07	6.26	1.55	0.05	0.00	0.00	4.18	2.74	8.55	29.84
Tehachapi	0.40	0.60	3.56	[0.20]	1.07	0.00	0.00	0.80	0.00	2.70	0.70	5.30	[15.33]
Tehama	0.20	0.30	10.41	0.62	0.34	0.95	0.00	0.00	0.00	11.58	3.41	11.45	39.26
Templeton	0.78	1.20	6.35	0.54	2.05	0.00	0.00	0.00	0.00	8.57	1.84	10.68	32.01

Towles	*?0.45*	*?0.90*	**0.60*	....	....	....	*0.00*	*0.00*	*0.00*	....	....	....	....
Tracy	*0.60*	*0.55*	*3.20*	*0.30*	*0.75*	*0.00*	*0.00*	*0.00*	*0.00*	*3.02*	*2.59*	*6.85*	*17.86*
Traver	*0.36*	*0.33*	*1.90*	*0.72*	*1.04*	*0.00*	*0.00*	*0.00*	*0.00*	4.65	1.10	3.55	13.65
Tropico	0.17	[0.90]	[6.50]	[0.30]	0.00	0.00	0.00	0.30	0.00	[7.00]	1.00	16.12	[32.29]
Truckee	0.80	1.40	2.51	1.01	4.51	0.00	0.00	0.00	0.00	3.13	3.29	2.51	19.16
Tulare	0.74	0.19	2.20	0.66	0.72	0.00	0.00	0.00	0.00	4.17	0.43	2.60	11.71
Turlock	0.31	0.33	2.11	0.17	0.92	T.	0.00	0.00	0.00	2.65	4.39	6.53	17.41
Upper Mattole	4.99	2.57	20.73	5.25	9.45	0.45	0.00	0.00	0.39	18.92	9.14	29.36	101.25
Vacaville (1)	0.44	0.98	7.92	0.80	3.04	0.15	0.00	0.00	0.00	7.98	4.26	12.48	38.05
Vacaville (2)	0.64	[0.90]	7.99	0.98	2.84	0.20	0.00	[0.00]	0.00	8.52	4.30	12.95	[39.32]
Valley Springs (1)	0.29	0.91	[illegible]	0.61	3.01	0.07	0.00	0.00	0.00	4.50	3.47	9.25	26.80
Valley Springs (2)	0.28	0.77	4.20	1.42	2.69	0.00	0.00	0.00	0.00	4.24	4.34	9.54	27.48
Vina	0.09	0.29	6.95	1.19	1.94	0.50	0.00	0.00	0.00	7.24	[7.00]	12.16	[37.36]
Volcano Springs	0.82	[0.10]	0.67	0.00	0.00	0.00	0.00	[0.00]	0.00	0.13	0.40	2.74	[4.86]
Walla Walla Creek	1.86	0.25	3.85	1.66	3.46	0.19	1.11	0.00	0.00	3.95	3.37	8.09	27.79
Walnut Creek	0.00	0.30	5.80	0.75	1.60	0.05	0.00	0.00	0.00	4.75	2.40	9.94	25.59
West Butte	0.12	0.36	5.78	0.63	1.45	0.50	0.00	0.00	0.00	4.75	3.00	7.37	23.96
Westley	[0.40]	0.33	2.60	0.41	0.88	T.	0.00	0.00	0.00	2.65	1.92	4.92	[14.11]
Wheatland	0.12	0.37	5.52	0.80	1.98	0.32	0.00	T.	0.00	6.41	3.16	7.51	26.19
Whittier	0.15	0.28	3.65	0.15	0.93	0.00	0.00	0.95	0.00	3.21	1.39	?0.00	10.71
Williams	0.32	0.50	3.42	0.15	0.95	0.05	0.00	0.00	[0.00]	4.00	[2.20]	7.50	[19.09]
Willow (1)	0.38	0.70	5.03	0.30	1.26	1.30	0.00	0.00	0.00	7.14	1.89	8.12	26.12
Willow (2)	0.54	0.66	[5.03]	0.27	0.71	0.30	0.00	0.00	0.00	6.83	2.30	8.52	[25.16]
Winters	0.36	0.50	8.40	0.58	1.92	0.15	0.00	0.00	0.00	5.95	4.58	12.74	35.18
Woodland (1)	[0.30]	0.55	6.21	0.62	[1.50]	0.35	0.00	0.00	0.00	5.32	3.75	8.48	[27.08]
Woodland (2)	0.19	0.49	6.14	0.84	2.01	0.43	0.00	0.00	0.00	5.54	3.54	8.16	27.34
Yreka	1.30	1.30	2.12	1.32	1.70	0.10	0.94	0.00	0.00	3.53	2.23	4.08	18.62
Colorado:													
Alma	0.33	0.19	0.08	1.02	2.35	0.76	1.53	3.45	0.48	0.53	[3.00]	[1.30]	[15.02]
Apishapa	....	....	....	....	....	....	....	....	1.03	1.70	2.75	0.20	....
Aspen	0.45	1.25	0.54	0.55	....	....	....	....	....	0.86	....	2.69	....
Bennet	....	0.40	1.00	5.85	5.05	1.80	....	....	....	....	....	0.15	....
Breckenridge	0.60	[0.60]	0.70	4.50	5.89	1.47	1.45	0.66	2.00	0.95	4.70	2.25	[25.77]
Brush	....	....	....	....	....	....	....	1.08	....	2.12	0.78	0.12	....
Burlington	0.54	0.41	1.80	3.38	....	2.23	....	....	....	....	....	....	....
Cañon City	0.29	1.74	0.20	1.92	1.33	0.67	1.07	2.09	1.01	1.18	0.78	0.25	12.53
Cherry Creek	....	....	....	....	....	....	2.18	1.01	0.51	1.26	....	0.23	....
Cheyenne Wells	....	....	2.30	1.93	1.98	5.10	....	....	....	....	0.44	0.00	....
Climax	0.73	0.94	0.71	2.13	4.21	1.43	1.48	1.63	1.20	1.56	3.15	0.98	20.15
Colorado Springs	0.16	0.60	0.12	1.17	2.34	1.77	2.88	1.49	0.86	2.08	0.16	0.14	13.77

*Incomplete.

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Colorado—Continued.													
Como (Ranch near)	0.47	0.72	0.41	1.33	2.74	0.68	2.41	1.92	0.47	0.85	1.30	1.06	14.36
Coulter	1.02	0.63	0.60	0.64	1.32	1.16	0.68	1.21	0.83	[0.40]	[0.50]	[1.60]	[10.59]
Delta	0.41	0.48	0.20	0.40	0.03	0.00	0.75	0.61	1.30	0.57	0.95	3.15	8.85
Denver (1)	0.50	0.70	0.40	1.34	3.44	1.88	2.94	0.33	0.28	2.11	0.53	0.30	14.75
Denver (2)	[0.50]	0.26	1.72	2.43	2.86	1.30	[2.94]	[0.33]	[0.28]	3.08	0.17	[0.30]	[16.17]
Durango	1.70	1.60	2.30	1.00	0.60	1.30	1.90	1.40	1.30	3.10	1.97	2.10	20.27
Eagle Farm	[0.35]	[0.40]	0.45	2.80	[1.60]	1.13	1.80	1.05	1.12	5.50	0.96	0.31	[17.47]
Eastonville	[0.40]	[0.30]	0.33	1.71	2.62	1.56	2.41	1.26	0.94	[3.00]	[0.20]	[0.30]	[15.03]
Elkhorn	......	......	......	......	......	......	......	1.68	0.57	2.65	0.57	0.42	......
Emma	......	......	......	......	......	......	......	......	0.99	0.51	1.97	2.26	......
First View	......	......	......	1.90	1.05	2.92	......	......	......	1.35	0.25	......	......
Fort Collins	0.22	0.34	0.65	2.07	3.39	2.16	0.78	0.95	0.42	3.16	0.42	0.02	14.58
Fort Crawford	2.36	0.50	[0.10]	0.78	0.41	0.38	0.82	1.35	0.67	0.44	0.37	1.20	[9.38]
Fort Lewis	1.62	0.80	0.95	0.20	0.40	0.60	3.26	1.07	0.90	2.28	2.05	7.68	21.81
Fort Logan	[0.20]	[0.10]	[1.00]	1.05	3.50	1.05	2.65	0.53	0.51	2.90	0.90	0.30	[14.69]
Fort Lyon	0.53	T.	0.64	1.19	1.09	1.41	2.62	1.06	0.09	2.46	[0.50]	[0.05]	[11.64]
Fraser	[0.20]	[0.50]	[0.30]	1.05	1.94	1.26	0.61	1.33	[0.60]	0.44	2.65	1.88	[12.76]
Georgetown	0.19	0.45	0.45	0.91	3.45	1.50	1.71	1.31	0.90	1.59	1.23	0.70	14.39
Glenwood Springs	1.24	1.50	1.00	0.54	1.06	0.54	0.51	2.44	0.94	1.53	2.42	3.87	17.59
Grand Lake	......	......	0.70	0.70	1.67	1.38	0.86	2.22	......	......	......	......	......
Greeley	0.30	0.30	0.58	1.95	2.74	3.12	1.90	1.09	0.25	1.92	0.21	0.22	14.58
Gunnison	0.29	0.02	0.05	3.10	0.12	0.16	0.10	0.82	0.48	T.	3.60	1.28	10.02
Hardin	......	......	......	......	......	......	......	......	0.30	1.47	0.30	0.65	......
Husted	0.54	0.25	0.27	2.17	3.23	1.63	2.59	0.78	0.55	2.03	0.33	0.28	14.65
Idaho Springs	0.22	0.33	0.84	1.14	3.91	1.28	2.63	1.26	0.59	[2.00]	0.48	0.46	[15.14]
Julesburg	0.08	0.07	0.72	3.05	2.16	3.90	3.52	1.12	0.35	0.74	0.31	[0.50]	[16.52]
Lamar	0.09	0.64	0.64	3.34	1.77	2.56	2.14	0.83	0.50	2.39	0.40	0.04	15.34
La Porte	......	......	......	......	......	......	0.68	0.73	0.35	2.74	0.07	T.	......
Las Animas	......	......	......	......	......	......	......	0.06	0.06	1.08	0.11	0.00	......
La Veta	......	......	......	......	......	......	......	0.80	1.48	3.80	......	0.30	......
Leadville	0.52	0.48	0.68	1.31	2.20	0.66	0.84	1.58	0.53	0.69	1.64	1.67	12.80
Livermore	......	......	......	......	......	4.08	1.47	1.33	0.70	3.82	0.19	0.04	......
Longmont	0.21	0.73	0.41	1.71	3.53	1.68	0.21	0.37	0.63	3.24	0.40	0.04	13.16

Loveland	......	......	......	......	......	......	......	......	*0.50*	*1.85*	*0.33*	*0.00*	......
Middle Box Elder	......	......	......	......	......	......	*0.57*	*0.39*	*0.28*	*3.91*	*0.16*	*0.03*	......
Monte Vista	*0.33*	*0.00*	*0.00*	*0.99*	*0.16*	*0.62*	*1.26*	*0.41*	*0.20*	*0.64*	*0.94*	*0.08*	5.72
Montrose	*0.59*	*0.44*	*0.05*	*0.86*	*0.60*	*0.28*	*0.84*	*0.35*	*0.80*	*0.47*	*0.58*	*1.34*	7.20
Ouray	*0.89*	*0.96*	*0.57*	2.10	......	......	......	......	......	......	......	......	......
Palmer Lake	0.62	0.33	0.71	2.94	3.74	2.57	3.00	2.67	1.31	3.18	0.78	0.45	22.30
Paoli	0.14	0.08	0.08	4.61	3.36	3.50	0.68	2.89	0.50	0.95	0.08	[0.20]	[17.07]
Parachute	......	......	......	......	......	......	......	0.31	0.76	1.05	1.21	0.84	......
Platoro	......	......	......	......	......	......	......	3.25	1.33	2.30	5.00	16.70	......
Platteville	0.02	0.08	0.09	0.40	0.29	1.26	......	......	......	......	......	......	......
Pueblo	0.34	0.24	0.51	1.57	1.40	0.84	0.81	1.60	0.69	1.62	0.72	0.16	10.50
Rifle Falls	0.81	0.96	1.12	0.85	1.40	0.31	0.71	1.28	0.89	1.11	1.50	3.44	14.38
Rocky Ford	0.36	0.12	0.67	2.14	1.65	0.75	4.50	1.32	0.26	1.68	0.77	0.05	14.27
Saguache	0.57	0.90	T.	1.20	0.20	0.10	0.94	1.40	0.14	0.90	[2.00]	[1.20]	[9.55]
San Luis Exp. Station	[0.60]	0.27	0.20	1.04	[0.20]	0.51	0.98	0.45	0.35	0.55	1.27	1.23	[7.65]
Sedgwick	......	......	......	......	......	......	......	......	0.30	0.73	0.05	0.06	......
Springfield	0.40	0.84	0.42	1.91	1.02	2.43	2.22	0.10	......	......	......	......	......
Stamford	......	......	......	......	......	......	......	......	1.80	4.25	3.70	1.00	......
Thon	T.	0.05	0.35	1.82	2.26	1.81	1.84	2.76	0.93	0.51	0.29	0.13	12.75
T. S. Ranche	0.33	0.84	0.38	0.50	0.60	0.14	T.	0.52	0.85	1.64	0.69	2.22	8.71
Upper Pine	......	......	......	......	......	......	3.02	1.56	0.67	2.24	0.70	0.48	......
Villa Grove	......	......	......	2.01	1.46	0.00	0.39	1.73	0.49	1.35	......	......	......
Wigwam	0.22	0.35	0.46	1.52	1.91	1.53	0.65	1.08	1.56	1.86	0.40	0.23	11.74
Connecticut:													
Birmingham	[4.40]	1.92	1.35	4.10	3.51	4.00	14.19	5.55	4.85	[4.00]	[7.00]	2.86	[57.73]
Canton	5.15	1.57	1.76	4.02	4.11	3.27	9.07	3.71	6.80	4.29	7.62	2.89	54.26
Clark's Falls	5.89	2.53	2.31	5.11	4.58	4.20	10.[illegible]8	4.40	5.74	5.13	7.47	2.48	60.42
Falls Village	......	......	......	......	5.10	4.31	9.49	2.60	4.47	3.55	5.58	3.01	......
Fort Trumbull	3.53	1.39	2.09	4.25	3.67	2.80	7.53	4.21	4.78	4.99	6.16	1.71	47.11
Hartford (1)	4.96	1.74	1.95	3.23	4.08	3.13	10.79	3.12	3.12	6.35	8.67	3.26	54.40
Hartford (2)	4.95	1.69	1.97	3.19	4.13	3.69	10.97	3.11	3.13	6.38	7.82	2.94	53.97
Hartford (3)	4.98	[1.69]	[1.97]	3.23	4.08	3.63	[10.97]	3.12	[3.13]	6.35	8.67	[2.94]	[54.76]
Lake Konomoc	6.15	1.99	2.93	5.47	3.46	5.47	10.31	5.20	5.36	[5.20]	[6.20]	3.02	[60.76]
Lebanon	......	......	......	......	......	......	11.37	5.04	6.15	5.86	6.06	3.12	......
Mansfield	4.03	1.64	1.96	3.49	2.16	3.50	11.39	3.78	4.00	5.52	5.91	2.88	50.26
Middletown	5.64	1.81	2.55	4.04	3.33	3.34	13.43	5.12	4.72	5.47	7.03	2.79	59.27
New Britain	......	......	......	......	......	4.63	11.03	3.17	4.29	4.97	8.61	2.98	......
New Hartford (1)	4.43	2.07	2.23	3.34	3.90	4.09	10.58	3.34	6.38	3.96	7.12	3.03	54.47
New Hartford (2)	5.00	[2.10]	1.85	4.49	[3.90]	4.91	11.70	2.36	6.82	4.09	7.58	1.93	[56.73]
New Haven	4.47	2.08	1.44	4.01	3.81	3.17	17.08	4.38	4.98	3.96	7.78	2.62	59.78
Newington	......	......	......	......	3.27	1.77	......	3.39	4.56	5.56	......	......	......

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Connecticut—Continued.													
New London	3.54	2.47	2.37	4.02	3.84	4.13	6.91	4.15	4.93	5.25	6.19	1.90	49.70
North Woodstock	[4.80]	[1.70]	[2.00]	2.46	3.57	2.94	11.34	3.56	2.90	4.20	5.70	[2.90]	[48.07]
Pomfret	......	......	......	......	1.50	2.14	11.53	4.61	......	......	......	......	......
Shelton	6.87	1.46	2.42	3.46	4.05	2.87	15.55	2.27	6.28	3.89	10.03	1.98	61.13
Southington	5.65	1.71	1.63	3.96	3.66	4.11	12.13	3.13	4.44	4.58	7.10	2.54	54.64
South Manchester	[5.60]	[1.90]	[4.00]	[3.70]	3.02	3.94	11.09	4.04	3.24	5.41	6.55	2.66	[55.15]
Uncasville	6.16	2.62	3.12	5.39	3.99	[3.70]	11.16	5.08	5.95	6.56	7.42	3.40	[64.55]
Voluntown	6.12	2.53	2.85	4.47	3.82	2.76	9.35	5.38	7.60	4.37	7.13	3.07	59.45
Wallingford	5.17	2.10	3.59	4.99	4.18	4.06	13.58	5.22	5.02	4.45	8.11	2.65	63.12
Waterbury	5.85	1.61	2.02	4.29	4.64	4.09	10.83	2.76	4.26	4.03	8.74	2.74	55.86
West Simsbury	3.20	8.67	3.42	[4.00]	[4.40]	3.20	8.67	3.42	4.66	4.01	6.83	2.47	[56.95]
Delaware:													
Newark	4.48	2.05	4.38	3.87	......	......	......	......	......	......	......	......	......
District of Columbia:													
Kendall Green	4.41	2.40	4.31	7.97	10.73	......	......	......	......	......	*3.47	......	......
Washington	4.05	2.47	4.20	9.13	10.69	5.01	8.13	3.07	3.88	4.48	6.03	0.19	61.33
Washington Barracks	[4.05]	[2.47]	[4.20]	9.59	10.01	6.36	9.06	3.80	4.48	4.62	6.41	0.30	[65.35]
Florida:													
Altamonte Springs	11.15	5.48	2.39	0.85	1.53	9.10	10.94	7.40	6.51	0.37	0.81	0.00	56.53
Alva	5.31	1.87	2.38	1.75	1.49	11.81	7.69	11.78	10.51	0.58	1.03	0.16	56.36
Archer	[8.10]	[3.60]	1.25	3.70	0.65	9.18	8.72	7.48	7.44	2.14	1.10	0.00	[53.36]
Fort Barrancas	8.05	3.91	8.02	1.64	2.87	5.03	12.35	6.77	6.64	1.27	5.69	0.39	62.63
Fort Meade	8.25	4.29	1.50	1.47	0.82	9.71	5.26	5.78	5.58	0.20	0.50	0.00	43.36
Homeland	7.45	4.20	1.20	1.40	1.40	6.55	4.50	5.90	5.65	0.15	0.20	0.00	38.60
Jacksonville	5.89	3.85	1.38	3.95	0.51	6.89	8.24	5.25	8.49	1.26	0.51	T.	46.22
Jupiter	9.84	4.16	2.00	2.33	3.45	9.80	4.00	7.85	6.15	3.05	2.47	0.36	55.46
Key West	2.42	1.05	6.89	1.15	1.08	6.48	1.51	9.40	13.87	3.16	5.38	0.28	52.74
Kissimmee	7.53	5.45	1.74	1.47	1.75	7.74	7.04	13.03	4.52	......	......	......	......
Lake City	[8.50]	[3.70]	3.17	3.50	0.88	[10.00]	[9.00]	9.37	9.89	1.25	2.30	0.00	[61.56]
Live Oak	......	......	......	......	0.33	10.12	9.56	14.02	6.67	0.00	0.00	......	......
Manatee	7.59	4.58	2.20	1.68	0.60	11.10	10.01	9.66	4.16	1.21	0.65	0.00	53.44
Matanzas	6.52	4.24	2.76	2.67	0.32	8.15	3.43	1.51	3.72	0.64	[4.00]	0.21	[38.17]
Merritt's Island	10.21	4.96	1.03	4.75	1.30	14.28	8.09	6.95	3.83	1.33	1.16	0.00	57.89
Micco	10.22	1.65	0.73	4.59	0.73	5.17	2.15	3.15	0.95	0.19	0.35	T.	29.88

Pensacola	*6.46*	*3.03*	*5.99*	*0.94*	*2.06*	*4.04*	*10.78*	*6.95*	*4.70*	*1.79*	*5.82*	*0.18*	*52.74*
St. Francis Barracks	*8.25*	*4.15*	*2.21*	*2.19*	*0.16*	*9.30*	*4.26*	*4.91*	*4.31*	*0.64*	*0.72*	*0.12*	*41.22*
Tallahassee	*8.85*	*3.85*	*2.75*	*3.20*	*2.80*	*5.83*	*6.18*	*4.75*	*[6.50]*	*0.75*	*3.38*	*0.00*	*[48.84]*
Titusville	*10.52*	*5.49*	*1.57*	*2.00*	*0.79*	*11.62*	*7.59*	*3.30*	2.87	2.05	0.97	0.03	48.80
Villa City	9.16	4.37	3.44	2.05	1.21	11.26	9.48	7.77	5.56	0.81	1.04	T.	56.15
Georgia:													
Albany	....	....	....	....	2.19	3.39	5.32	4.28	2.30	0.00	1.75	....	....
Allapaha	....	....	....	....	0.24	3.11	3.76	6.47	2.29	1.75	2.75	....	....
Andersonville	9.27	4.13	2.92	3.71	1.78	2.00	8.05	4.80	1.75	2.00	2.55	0.00	42.96
Athens (1)	....	....	....	....	3.24	6.54	4.06	8.06	4.02	2.14	4.26	0.58	....
Athens (2)	5.84	5.68	2.97	2.15	3.16	5.37	2.46	9.08	4.06	2.10	3.72	0.63	47.22
Atlanta	6.39	5.28	2.49	2.54	3.16	5.03	8.83	6.73	6.32	2.21	5.17	0.60	54.75
Augusta	6.92	5.78	2.72	2.71	1.02	4.02	10.10	8.68	2.43	1.59	2.73	0.55	49.25
Bainbridge	....	....	....	....	1.13	3.02	2.19	4.23	2.14	0.90	0.94	....	....
Camak	....	....	....	....	0.75	5.67	7.08	3.13	2.10	1.69	4.79	....	....
Cartersville	....	....	....	....	1.04	6.98	6.55	4.30	2.79	1.42	5.02	....	....
Columbus	....	....	....	....	2.46	6.09	8.42	....	3.99	....	5.69	....	....
Diamond	[5.80]	12.65	6.85	4.25	8.10	11.88	20.45	15.56	5.35	1.45	8.13	1.10	[101.57]
Duck	5.72	5.75	2.71	2.46	4.92	4.80	10.51	6.29	5.80	1.80	5.03	[1.00]	[56.79]
Eastman	....	....	....	....	0.10	1.18	5.15	6.76	2.51	0.00	3.51	....	....
Forsyth	8.86	6.74	2.48	3.52	1.98	7.94	8.21	5.50	3.70	3.12	5.28	0.79	58.12
Fort Gaines	....	....	....	....	2.40	0.83	8.11	3.82	1.19	0.00	....	....	....
Fort McPherson	....	....	....	....	....	....	8.67	10.85	6.09	1.96	5.34	0.72	....
Gainesville	....	....	....	....	6.10	2.65	3.84	8.41	8.45	1.40	3.63	....	....
Griffin	....	....	....	....	2.96	3.82	3.59	8.00	4.12	3.03	4.07	....	....
Hephzibah	10.24	5.13	0.21	1.20	0.81	0.82	8.65	8.70	2.91	1.20	1.51	0.06	41.44
Jesup	....	....	....	....	0.00	4.50	8.07	9.13	2.18	1.31	0.46	....	....
Macon	....	....	....	....	1.40	2.82	5.95	4.85	3.00	1.95	0.75	....	....
Marietta	6.52	3.86	3.29	2.44	2.51	7.41	6.69	6.68	6.85	1.50	4.37	0.56	52.68
Milledgeville	6.93	5.20	3.19	4.30	0.72	2.45	9.21	4.29	2.50	1.65	3.93	0.39	44.76
Millen	....	....	....	....	2.04	5.17	6.84	6.70	2.47	1.72	1.53	....	....
Newnan	....	....	....	....	2.32	7.59	4.31	7.49	4.14	2.35	4.30	....	....
Point Peter	....	....	....	....	2.15	4.80	4.35	8.40	3.95	1.85	3.70	0.85	....
Quitman (1)	10.40	5.40	3.75	2.70	1.05	13.90	7.50	4.10	7.60	1.00	2.57	T.	59.97
Quitman (2)	....	....	....	....	0.83	2.53	7.15	2.00	1.81	0.75	1.35	....	....
Savannah	6.36	3.92	3.52	2.36	0.35	9.73	6.21	7.50	4.68	0.34	2.58	T.	47.55
Smithville	....	....	....	....	2.92	2.35	7.13	3.22	1.40	....	1.93	....	....
Thomasville (1)	....	....	....	....	1.66	3.83	7.64	4.65	1.82	0.96	4.38	....	....
Thomasville (2)	[9.00]	[4.20]	2.86	2.78	1.59	2.84	7.63	5.69	1.80	1.02	4.18	T.	[43.59]
Toccoa	....	....	....	....	2.87	2.76	7.47	10.17	8.97	0.77	....	....	....

* Incomplete.

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Georgia—Continued.													
Union Point	......	......	......	......	0.68	3.21	6.11	8.87	1.82	1.04	3.13	......	......
Washington	......	......	......	......	0.51	2.03	4.55	3.64	2.07	1.30	1.40	......	......
Way Cross	......	......	......	......	0.01	7.72	5.83	5.01	1.40	......	0.40	......	......
Waynesborough	......	......	......	......	0.46	3.09	8.83	5.50	1.49	1.40	2.12	......	......
West Point	......	......	......	......	2.60	3.32	4.40	5.50	2.76	2.52	6.95	......	......
Idaho:													
Boisé Barracks	T.	T.	0.68	1.42	2.58	0.14	0.00	0.26	0.06	1.24	0.26	1.48	8.12
Boisé City	0.44	0.04	1.03	1.72	2.76	0.19	T.	0.41	0.06	1.40	0.86	2.04	10.95
Era	......	......	......	......	......	......	0.18	0.10	T.	0.97	1.15	5.13	......
Fort Sherman	3.49	0.42	2.59	0.93	1.54	0.76	T.	0.24	0.38	1.07	1.14	5.85	18.41
Kootenai	......	......	......	......	......	......	......	0.58	......	0.74	1.78	3.70	......
Lewiston	0.41	0.46	1.30	1.00	2.83	0.90	0.00	0.27	0.44	1.28	0.65	1.19	10.73
Soda Springs	......	......	......	......	......	0.17	0.18	2.02	1.06	1.84	1.13	5.54	......
Illinois:													
Aledo	1.37	1.87	1.49	3.03	4.68	5.35	......	......	......	......	......	......	......
Atwood	2.18	2.10	4.34	......	7.32	10.17	6.15	1.39	......	......	......	......	......
Aurora	2.06	1.32	1.47	2.63	3.82	4.38	5.08	......	3.82	1.11	2.87	2.53	......
Beardstown	[2.00]	[2.20]	[1.10]	4.20	7.05	7.57	5.32	2.70	3.61	4.63	1.73	0.40	[42.51]
Beason	1.72	1.88	1.61	0.95	4.19	7.07	4.71	0.30	4.81	1.70	4.10	1.50	34.54
Belvidere	1.36	1.45	1.55	2.64	5.00	2.34	2.39	0.62	2.12	0.50	1.95	1.88	23.80
Brush Hill	2.28	2.19	1.17	2.89	4.12	9.32	4.76	1.17	2.97	[1.60]	[2.70]	[2.30]	[37.47]
Cairo	4.61	1.57	1.40	0.97	1.91	8.07	5.15	1.10	3.82	2.81	5.56	0.77	37.74
Cedarville	1.39	1.25	0.87	2.72	3.32	1.65	4.31	0.37	3.75	[0.60]	[1.10]	[2.50]	[23.83]
Centralia	3.52	1.67	1.15	1.50	6.33	7.07	4.10	1.53	3.18	1.95	6.56	1.60	40.16
Charleston	1.80	1.63	1.25	0.90	4.19	[7.50]	5.65	1.53	[2.90]	2.01	[4.60]	[1.00]	[34.96]
Chicago	1.64	1.31	1.43	2.35	5.38	2.93	9.56	0.39	2.75	1.82	3.49	1.90	34.95
Collinsville	[4.50]	4.87	1.70	1.72	3.11	3.66	2.81	1.85	5.13	1.59	4.64	1.30	[36.88]
Dwight	1.47	2.82	2.23	2.12	4.24	6.34	6.12	0.89	2.92	1.79	3.10	1.79	35.83
Fairfield	2.65	1.25	2.21	[1.10]	4.40	5.75	4.72	1.75	5.49	[2.00]	[5.30]	[2.00]	[38.62]
Flora	2.60	2.49	2.23	1.16	4.88	11.49	6.14	2.00	5.66	[2.30]	5.45	2.11	[48.51]
Fort Sheridan	[1.60]	3.40	1.40	2.80	3.22	4.10	3.17	0.31	2.20	0.75	0.65	4.75	[28.35]
Gibson City	1.36	......	......	0.88	......	......	......	......	......	0.38	2.62	1.75	......
Golconda	4.54	1.15	1.58	0.95	3.38	7.27	5.27	1.57	4.78	1.58	6.58	2.53	41.18

Grand Tower	*2.69*	*1.40*	*2.10*	*2.45*	*3.71*	*4.55*	*5.55*	*0.55*	*5.45*	*1.45*	*4.55*	*3.40*	*37.85*
Greenville	*2.65*	*2.04*	*1.81*	*1.70*	*7.10*	*4.43*	*3.45*	*0.58*	*4.24*	*2.50*	*5.30*	*1.57*	*37.37*
Griggsville	*2.84*	*2.40*	*1.05*	*[2.30]*	*9.38*	*4.93*	*2.87*	*0.76*	*4.56*	*4.47*	*1.12*	*2.02*	*[38.70]*
Hennepin	*1.65*	*0.85*	*1.60*	2.60	4.12	5.72	4.97	*0.75*	*3.83*	2.02	1.86	1.45	31.42
Irishtown	2.76	1.76	1.81	[1.50]	4.93	6.41	4.86	1.09	3.43	1.83	5.32	1.48	[37.18]
Jordan's Grove	3.55	2.35	1.68	[1.60]	3.68	8.11	3.41	3.59	2.27	1.51	5.15	1.66	[38.56]
Lacon	2.28	0.61	1.99	2.57	3.92	4.93	4.53	0.15	2.96	2.25	2.71	1.77	30.67
Lake Forest	1.62	1.27	1.82	2.83	4.60	4.21	4.77	0.71	2.22	2.40	2.45	2.66	31.56
Lanark	1.66	1.17	1.49	3.87	3.55	3.17	6.42	0.38	4.71	1.02	1.10	2.63	31.17
Louisville	......	......	......	......	......	6.20	6.79	2.56	5.60	1.95	4.15	1.60	......
Martinsville	1.01	1.08	0.99	0.27	[4.20]	7.65	[3.00]	[1.30]	[5.00]	3.34	4.67	0.91	[33.42]
Mascoutah	2.65	[4.80]	0.80	2.20	4.90	5.00	6.40	1.30	4.20	2.40	4.80	1.60	[41.05]
Mattoon	1.85	0.59	1.40	1.00	5.33	6.30	7.90	1.87	3.13	2.00	5.00	2.25	38.62
McLeansborough	3.20	2.36	1.95	0.88	2.80	[5.00]	4.31	3.02	4.33	1.52	5.74	1.77	[36.88]
Mount Carmel	3.24	1.76	1.47	2.04	5.60	4.72	3.60	2.13	3.84	2.29	7.11	2.82	40.62
Mount Morris	3.10	2.20	0.70	3.00	2.90	2.30	3.60	0.70	2.95	1.20	[1.80]	[2.20]	[26.65]
Olney	2.73	2.66	1.91	1.23	4.70	5.71	7.59	3.32	5.09	2.71	4.66	3.96	46.27
Oneida	1.73	1.30	1.35	4.30	3.90	4.13	2.00	0.50	2.35	1.65	3.20	1.90	28.31
Oswego	1.57	1.03	1.28	2.23	3.12	4.98	4.44	0.75	3.44	1.00	2.83	1.91	28.58
Ottawa	1.91	1.16	1.77	2.44	4.36	4.61	5.67	2.00	3.92	1.51	3.12	1.80	34.27
Palestine	2.72	2.20	1.71	1.37	4.00	5.50	2.46	2.95	5.44	2.33	5.43	1.93	38.04
Pana	2.73	2.05	3.25	1.25	6.83	4.68	2.24	0.08	4.57	2.75	8.16	4.33	42.92
Pekin	2.15	2.10	2.02	2.54	3.47	7.70	4.15	1.02	2.62	2.25	4.90	1.16	36.08
Peoria (1)	[1.70]	[0.84]	[1.50]	2.92	5.82	6.60	7.63	1.27	2.65	1.87	4.60	1.64	[39.04]
Peoria (2)	1.70	0.84	1.50	2.79	3.92	6.30	7.64	1.23	2.61	2.28	2.91	1.33	35.05
Philo	1.23	2.19	1.36	1.04	5.88	11.16	4.47	0.84	2.64	3.21	3.48	2.04	39.54
Pontiac	1.39	0.97	1.53	1.35	5.50	2.45	4.65	0.11	3.80	1.62	3.10	1.65	28.12
Quincy	......	......	......	......	8.25	3.48	3.70	1.05	......	3.95	......	......	......
Richview	3.27	2.88	2.86	1.27	4.72	10.04	6.20	1.64	4.60	1.66	[5.50]	[1.60]	[46.24]
Riley	1.86	1.21	1.56	2.48	4.09	3.25	3.44	0.77	1.68	0.40	2.34	1.44	24.52
Rockford	2.96	1.51	1.32	2.88	6.61	3.93	2.02	0.74	1.95	0.67	2.38	2.83	29.88
Rock Island Arsenal	4.20	1.45	2.31	4.18	5.55	4.93	8.59	1.07	4.29	1.15	2.35	1.56	41.63
Rushville	1.70	1.86	0.81	......	......	......	......	......	......	......	3.79	1.20	......
Sandwich	2.27	2.88	0.87	3.15	3.08	5.40	3.67	0.79	3.12	1.47	2.63	1.82	31.15
South Evanston	1.57	1.03	1.48	1.75	4.02	4.45	4.42	0.88	2.42	1.72	2.30	2.03	28.07
Springfield	2.13	1.64	1.97	0.71	6.64	3.65	2.14	0.78	4.74	2.86	4.05	2.00	33.31
Sumner	3.20	1.60	1.40	1.10	3.20	......	......	......	......	......	......	......	......
Sycamore	1.13	1.16	1.39	3.47	5.17	1.50	4.48	0.86	1.93	0.85	1.80	1.52	[25.26]
Warsaw	[1.80]	[2.20]	[1.00]	1.35	3.36	1.70	3.28	1.15	2.20	0.14	0.03	0.18	[18.39]
Watseka	1.39	1.70	1.65	1.28	6.40	5.65	6.54	2.01	2.71	2.68	3.15	1.53	36.69
White Hall	2.12	2.10	2.51	1.09	10.63	3.87	4.07	1.04	4.22	3.34	4.08	0.06	39.13

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Illinois—Continued.													
Willow Hill	1.83	3.50	0.72	0.12	....	5.85	3.16	....	....	....	....	....	....
Windsor	1.97	1.41	1.69	0.71	7.36	6.53	5.70	1.93	4.26	2.06	4.47	[2.20]	[40.29]
Winnebago	2.18	2.00	1.40	4.14	5.42	3.20	2.77	0.10	1.66	0.62	1.73	2.83	28.05
Woodstock	2.25	....	....	....	....	4.40	....	....	....	....	2.88	2.20	....
Indiana:													
Angola	1.44	1.44	2.36	1.19	6.25	3.50	7.01	0.91	1.40	1.45	3.57	2.34	32.86
Blue Lick	3.04	1.85	0.87	0.95	5.55	4.22	7.63	0.47	3.58	[1.80]	5.78	2.49	[38.23]
Butlerville	3.62	1.04	1.14	1.21	6.43	3.71	5.65	0.48	5.18	2.91	6.49	2.77	40.63
Cannelton	3.63	1.69	1.00	0.54	4.53	4.25	6.17	1.18	3.64	0.55	6.38	2.81	36.37
Columbia City	1.78	1.40	2.46	1.05	5.95	3.79	4.35	1.46	1.84	0.99	3.21	2.10	30.38
Columbus	2.80	1.15	0.87	0.64	4.80	4.38	4.26	0.16	4.26	2.78	4.57	2.59	33.26
Connersville	3.09	0.79	0.85	0.89	6.59	3.76	3.15	0.24	3.34	1.90	4.15	3.04	31.79
Dana	1.30	1.37	2.28	0.75	4.53	5.31	6.00	1.05	3.27	1.30	2.52	2.15	31.83
Degonia Springs	3.30	1.49	1.81	0.98	4.04	4.49	5.70	1.32	8.22	1.84	6.15	3.65	42.99
Delphi	1.26	1.43	1.18	0.81	7.25	[4.40]	6.81	0.68	3.08	1.07	3.55	1.79	[33.31]
Evansville	3.60	1.00	1.30	1.50	5.00	5.05	5.25	1.43	6.58	2.16	7.95	3.57	44.39
Farmland	1.78	0.74	1.72	1.07	4.15	5.59	3.69	1.08	3.04	0.95	4.26	1.77	29.84
Franklin	2.64	1.01	1.35	1.21	4.37	6.00	[5.00]	[0.50]	4.22	2.42	4.81	2.00	[35.53]
Huntertown	[1.69]	1.68	1.69	[1.10]	5.56	4.25	2.13	2.00	0.38	[1.00]	[3.40]	[2.20]	[26.99]
Huntingburg	4.35	1.80	0.80	0.55	6.55	3.62	9.50	2.00	8.90	2.85	8.20	4.55	53.67
Huntington	1.88	1.66	0.99	0.42	3.93	4.37	6.26	0.36	2.21	1.02	3.13	2.77	29.00
Indianapolis	2.52	1.29	2.15	2.07	5.76	4.88	5.98	0.54	3.79	1.70	4.97	2.76	38.41
Jeffersonville	3.34	3.25	0.89	0.88	5.78	4.94	3.38	0.31	5.49	1.77	6.26	2.22	38.51
Laconia	3.20	1.75	0.50	0.65	5.46	6.45	....	....	....	....	....	....	....
La Fayette	1.05	1.20	1.69	0.84	6.41	4.14	5.29	3.53	2.77	1.31	3.82	2.01	34.06
Logansport	1.09	1.99	1.50	0.90	6.51	4.79	7.52	1.67	3.13	1.00	3.81	2.50	36.41
Marengo	4.96	3.62	1.10	0.60	....	6.52	10.50	0.85	....	2.50	9.25	4.90	....
Marion	2.20	1.40	1.70	0.50	3.20	2.60	3.10	0.50	2.10	0.60	2.50	2.60	23.00
Manzy	3.17	0.83	1.70	2.08	6.09	5.19	4.22	0.29	4.78	1.60	4.82	2.13	36.90
Mount Vernon (1)	4.03	1.23	1.15	[5.10]	4.43	4.80	5.93	2.26	5.80	2.17	6.55	3.41	[46.86]
Mount Vernon (2)	3.98	1.59	1.29	[4.20]	4.53	4.80	5.94	2.26	5.80	2.17	6.55	3.41	[46.52]
New Providence	3.25	2.11	0.85	0.92	4.78	3.91	4.45	0.49	2.34	[2.00]	[8.70]	[3.80]	[37.60]
Point Isabel	2.20	0.25	2.00	1.10	9.25	4.05	5.03	0.88	1.39	0.92	6.10	5.20	38.37

Princeton	*3.30*	*1.90*	*2.00*	*0.80*	*4.40*	*3.60*	*5.35*	*1.55*	*7.10*	*3.00*	*7.50*	*3.60*	*44.10*
Richmond	*2.45*	*0.92*	*0.82*	*0.82*	*6.75*	*3.74*	*4.00*	*1.41*	*4.80*	*1.83*	*4.58*	*2.92*	*35.04*
Rockville	*2.70*	*3.00*	*1.25*	*1.05*	*5.75*	*5.00*	*6.25*	*1.35*	*4.25*	*3.30*	*4.60*	*4.05*	*42.55*
Rushville	3.28	1.13	1.78	3.31	6.74	5.03	3.42	0.47	4.13	1.55	4.70	1.80	37.34
Salem	3.68	1.89	1.06	1.10	5.29	....	n4.06	....	....	....	....	....	....
Scalesville	2.78	2.49	2.15	1.29	4.27	4.94	7.68	1.18	8.15	1.55	7.06	2.01	45.55
Seymour	3.50	1.79	0.93	1.27	6.14	4.61	6.74	0.22	3.45	2.29	5.86	3.44	40.24
Shelbyville	....	....	....	....	4.65	5.10	3.92	0.10	....	2.92	3.19	4.35	....
Spiceland	2.87	1.19	2.08	1.68	6.43	4.70	6.03	0.41	3.80	2.14	4.73	3.06	39.12
Sunman	3.49	1.00	1.23	1.54	5.72	5.96	5.30	0.36	5.42	2.27	4.66	3.40	40.35
Vevay	2.82	1.47	0.85	0.92	6.17	4.46	6.93	0.02	5.19	2.55	6.06	2.81	40.25
Vincennes	3.80	1.74	1.19	2.24	4.75	6.76	6.00	0.88	7.34	2.71	7.72	2.89	48.02
Worthington	2.72	1.41	2.01	1.54	2.90	7.32	6.40	0.96	5.68	2.62	6.18	2.14	41.88
Indian Territory:													
Cantonment	0.96	1.20	2.02	2.31	1.09	2.97	2.39	2.86	[4.60]	2.32	0.92	0.00	[23.64]
Eufaula	3.21	1.05	2.71	1.10	3.93	4.83	1.60	3.68	6.65	0.93	4.65	0.20	34.54
Fort Gibson	4.54	2.35	3.41	2.00	5.70	2.43	0.64	0.65	5.63	1.74	3.76	0.24	33.09
Fort Reno (1)	2.59	3.05	2.71	1.13	2.09	7.12	2.54	5.35	4.78	1.91	1.24	0.06	34.57
Fort Reno (2)	1.79	2.84	2.59	1.22	1.80	6.55	2.54	4.88	4.48	1.88	1.29	0.05	31.91
Fort Sill (1)	2.71	0.87	1.68	1.90	3.63	4.26	1.87	3.82	4.69	2.82	1.12	T.	29.37
Fort Sill (2)	[2.71]	[0.87]	1.63	1.90	3.52	4.25	1.81	3.82	4.69	2.61	1.48	0.00	[29.29]
Fort Supply (1)	0.88	0.11	2.82	3.10	1.97	3.82	1.81	4.04	1.97	5.58	1.32	T.	27.42
Fort Supply (2)	0.90	0.10	2.11	1.33	2.29	2.90	2.17	3.45	2.02	4.99	1.35	0.00	23.61
Guthrie	....	....	....	....	4.26	9.94	4.72	3.79	2.10	2.14	1.14	0.05	....
Jimtown	4.30	1.79	0.50	1.64	2.61	6.15	5.98	5.42	7.31	[2.00]	[1.20]	[0.05]	[38.95]
Lehigh	....	....	....	....	....	....	2.47	3.47	16.71	2.01	....	....	....
Oklahoma	....	....	....	....	....	h3.39	2.21	3.56	4.56	....	....	....	....
Tulsa	3.54	0.25	4.00	0.96	3.28	2.20	2.80	0.80	3.85	2.05	2.55	0.00	26.28
Woodward	0.90	0.09	2.66	....	1.80	3.00	1.60	....	....	5.25	....	....	....
Iowa:													
Alta	1.67	1.06	2.82	1.95	....	....	....	....	....	....	....	....	....
Amana	1.48	0.47	0.38	3.56	4.46	5.07	3.95	1.19	4.37	1.12	0.84	0.86	27.75
Ames	1.80	0.48	T.	2.21	4.18	4.90	4.10	0.87	2.47	0.40	1.15	0.95	23.51
Bancroft	1.05	T.	T.	1.30	1.97	1.69	3.45	0.12	1.19	0.17	1.32	1.40	13.66
Belle Plaine	....	....	....	....	....	....	....	1.56	2.94	0.74	0.78	0.63	....
Blakeville	[1.40]	0.40	0.00	2.28	6.46	5.99	1.50	2.87	3.58	T.	2.71	2.39	[29.58]
Carroll	....	....	....	....	....	....	....	2.07	1.08	0.21	1.16	0.71	....
Carson	....	....	....	....	....	....	....	9.95	2.90	0.25	1.70	0.10	....
Cedar Rapids	1.44	0.87	0.42	2.91	5.15	4.11	5.79	1.65	3.70	1.49	1.03	1.62	30.18
Clarinda	1.50	0.12	0.25	3.10	4.10	4.15	5.50	2.35	1.45	0.70	0.97	0.25	24.44
Clinton	2.05	1.07	1.19	2.61	3.53	4.94	7.21	1.06	3.44	1.36	0.69	1.68	30.83

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Iowa—Continued.													
Cresco	1.55	0.56	0.22	1.58	4.18	4.91	2.86	0.92	2.87	0.13	2.22	1.33	23.33
Cromwell	1.80	0.12	....	3.11	3.50	3.00	3.70	....	....	....	....	....	....
Davenport	0.95	1.44	1.74	3.89	6.34	5.59	8.25	1.11	3.27	1.26	2.17	1.60	37.61
Denmark	1.68	1.09	1.75	2.99	4.72	5.95	6.39	....	....	....	....	....	....
Des Moines	1.22	0.27	0.11	2.66	4.84	4.39	4.37	2.25	3.41	0.52	1.29	0.57	25.90
Dubuque	1.55	1.34	0.30	3.56	4.00	3.87	4.22	0.26	1.54	0.66	1.57	1.38	24.25
Dunkerton	....	0.20	0.05	3.49	8.54	7.60	....	....	....	....	....	....	....
Dysart	1.10	0.82	0.00	2.80	6.40	5.45	3.70	1.10	....	....	....	....	....
Eagle Grove	....	....	....	....	6.45	5.75	4.30	0.60	1.55	0.00	0.60	1.00	....
Elkader	1.45	T.	0.40	3.95	4.65	3.90	2.90	0.20	3.56	T.	1.50	3.20	25.71
Fayette	1.19	0.63	0.39	2.92	4.58	5.10	1.96	1.20	3.62	0.38	0.92	2.85	25.74
Fort Madison (near)	1.64	1.50	1.42	2.89	5.61	4.49	4.31	1.12	5.17	1.94	2.52	1.21	33.82
Gillett	0.79	0.33	0.40	1.10	2.90	4.86	2.90	0.31	2.20	T.	[1.70]	[1.20]	[18.69]
Glenwood (1)	0.18	0.11	[0.60]	0.67	4.08	3.74	8.50	2.75	2.15	0.18	1.55	0.26	[24.77]
Glenwood (2)	1.33	0.01	0.72	2.31	[4.08]	3.36	7.15	2.77	2.07	0.55	0.05	0.29	[24.69]
Grinnell	1.00	0.30	0.33	3.52	6.76	3.94	5.14	2.39	3.84	0.60	0.80	1.28	29.90
Hampton	1.10	0.50	0.16	2.62	7.38	4.36	2.70	0.69	0.99	0.13	1.72	1.94	24.29
Humboldt	0.89	0.34	0.24	1.51	4.11	4.50	3.48	2.41	1.01	0.15	1.64	0.86	21.14
Independence	1.23	0.52	0.38	3.37	5.88	4.83	1.62	0.84	3.99	T.	0.62	1.24	24.52
Iowa City	2.19	1.10	0.53	3.82	3.28	3.85	4.41	1.46	3.13	0.79	1.34	1.13	27.03
Keokuk	1.89	0.90	1.04	3.60	5.72	2.97	6.78	0.95	5.14	2.88	1.80	1.08	34.75
Le Claire	[1.60]	[1.20]	[0.60]	4.13	5.13	4.47	7.06	1.23	2.43	0.75	2.11	1.45	[32.16]
Logan	1.49	T.	0.69	1.35	3.28	9.87	6.28	3.14	1.32	0.46	1.85	0.14	29.87
McCausland	....	....	....	....	....	....	....	1.15	3.33	0.99	1.51	1.76	....
Manson	1.45	1.70	0.20	1.46	2.90	8.12	4.72	0.55	1.26	0.27	2.08	1.55	26.26
Maquoketa	1.80	1.41	0.66	2.92	5.08	3.47	4.10	0.70	3.37	0.85	1.74	2.39	28.49
Monticello	1.72	0.79	0.15	3.32	4.56	4.89	4.23	0.22	2.62	1.25	0.98	1.55	26.28
Mount Pleasant	0.75	1.43	0.50	3.84	5.83	4.66	2.84	0.77	5.42	1.70	1.83	0.82	30.39
Mount Vernon	[1.40]	[0.90]	0.17	6.03	5.98	5.15	4.87	2.23	3.45	1.40	0.95	1.05	[33.58]
Muscatine (1)	1.43	1.38	0.65	4.28	4.17	5.68	6.69	1.15	3.95	1.04	1.65	1.40	33.47
Muscatine (2)	....	....	....	....	5.79	4.84	7.38	1.30	4.25	0.78	1.24	....	....
Osage	1.52	0.35	T.	2.20	3.73	2.68	1.92	2.27	1.49	0.02	1.85	1.26	19.29
Osceola	1.60	0.40	?0.00	2.35	....	....	....	....	....	....	....	....	....

Oskaloosa (1)	*1.12*	*0.40*	*[2.40]*	*2.00*	*3.25*	*4.75*	*2.38*	*0.56*	*4.25*	*0.62*	*0.87*	*0.75*	*[23.35]*
Oskaloosa (2)	......	......	......	*3.00*	*3.33*	*5.05*	*2.50*	*0.92*	......	......	......	......	......
Sac City	2.15	0.20	0.30	0.25	2.37	7.73	8.17	1.20	1.65	0.45	2.40	1.30	28.17
Sioux City	......	......	......	......	......	......	3.31	1.19	1.71	0.21	1.99	1.14	......
Storm Lake	......	......	......	......	......	......	6.15	1.52	1.34	0.36	1.46	0.76	......
Vinton	0.70	0.17	0.29	3.01	4.95	4.31	3.54	0.83	2.62	0.32	0.90	0.75	22.39
Washington	1.33	0.75	0.69	2.73	3.53	5.26	1.19	0.78	7.19	1.13	1.49	0.93	27.00
Webster City	[1.10]	0.32	0.06	1.94	5.72	4.61	3.44	2.15	1.01	0.18	1.20	1.05	[22.78]
Wesley	0.50	0.60	0.10	0.95	1.95	2.15	3.35	0.70?	0.70	0.10	1.85	1.35	14.30
West Bend	......	......	......	......	......	......	4.95	4.36	0.98	0.31	1.56	1.18	......
Kansas:													
Abilene	......	......	......	3.02	9.05	2.57	5.05	1.70	2.45	2.34	......	......	......
Allison	1.82	0.26	1.45	1.94	3.32	2.95	6.34	1.66	1.70	2.00	0.41	0.01	23.86
Arlington	1.25	0.28	2.00	5.20	4.90	5.22	6.80	0.70	4.40	4.60	[1.10]	T.	[36.45]
Atwood	......	......	......	......	5.08	10.03	5.50	3.25	......	1.10	......	......	......
Augusta	[0.90]	[0.20]	2.59	3.70	4.27	6.67	3.84	4.36	3.36	1.31	[1.20]	0.00	[32.40]
Belleville	[1.40]	0.65	2.13	[2.40]	5.03	1.98	6.55	2.26	[2.20]	[1.50]	[1.20]	T.	[27.30]
Bendena	1.00	1.25	0.88	1.50	4.82	1.44	8.56	4.58	1.62	1.31	1.12	0.00	28.08
Brookville	1.80	[0.50]	2.40	4.60	8.60	4.70	5.50	3.50	[1.60]	[2.60]	3.25	0.00	[39.05]
Bucklin	1.30	0.25	2.20	3.00	1.30	2.15	4.15	1.40	1.10	3.25	0.50	0.00	20.60
Buffalo Park	[0.90]	0.60	......	......	1.00	2.81	2.27	......	......	......	0.30	0.00	......
Bunker Hill	2.00	0.45	0.40	5.25	7.75	1.67	3.99	0.95	0.25	3.30	1.00	0.00	27.01
Burr Oak	1.35	0.25	2.35	2.75	6.07	3.38	11.75	2.62	0.50	[1.80]	2.00	0.00	[34.82]
Carneiro	0.34	0.13	0.88	2.00	[4.20]	[3.30]	3.25	1.70	1.25	2.90	1.30	0.00	[21.25]
Cawker City	1.00	0.50	1.80	2.20	5.20	5.70	4.60	1.90	0.50	2.60	0.15	0.00	26.15
Colby	0.89	0.11	1.22	1.50	2.28	4.33	2.41	......	......	......	......	......	......
Coldwater	1.20	0.30	......	1.90	3.90	4.75	3.86	2.60	3.40	......	......	......	......
Collyer	......	......	......	......	2.33	2.12	2.25	0.95	1.00	3.12	2.50	0.00	......
Concordia (1)	1.42	0.59	2.25	3.48	5.65	2.46	8.29	4.90	1.90	1.90	1.62	0.01	34.47
Concordia (2)	1.40	0.42	1.73	[2.80]	3.80	[2.80]	8.90	3.30	1.30	1.70	0.82	0.00	[28.97]
Conway	1.05	0.50	1.15	3.65	11.60	5.20	3.65	2.10	1.60	2.95	2.20	T.	35.65
Cunningham	0.75	0.24	1.89	5.95	3.46	4.54	5.24	2.07	2.72	3.26	1.13	0.00	31.25
Dodge City	1.69	0.34	1.38	2.12	1.54	3.43	2.02	2.14	0.86	2.88	0.77	0.00	19.17
Dorrance	0.50	0.50	1.50	6.00	8.03	1.68	4.90	0.60	0.15	6.75	[0.85]	0.00	[31.46]
Downs	1.46	0.65	2.74	3.02	7.00	3.98	6.65	0.86	0.53	2.42	0.65	0.00	29.96
Dwight	......	......	......	2.20	8.20	3.32	6.20	2.25	3.25	1.60	......	......	......
Elco	......	......	1.90	3.35	6.88	7.70	......	2.81	3.05	1.55	......	......	......
Elk Falls	1.35	1.36	2.63	3.47	5.20	3.50	7.26	2.16	5.81	1.82	1.33	0.20	36.09
Ellis (1)	[1.40]	0.30	[0.85]	0.90t	5.80	6.45	1.00	2.80	0.00	1.62	1.00	0.00	[22.12]
Ellis (2)	......	......	......	......	......	6.35	2.25	5.00	0.00	......	......	0.00	......
Ellsworth	1.70	0.30	1.00	3.90	7.10	2.50	2.60	[2.40]	0.20	3.30	1.00	0.00	[26.00]

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Kansas—Continued.													
Emporia	T.	1.25	3.06	3.34	8.15	4.35	3.89	2.19	7.00	0.94	1.80	0.60	35.97
Englewood	1.21	0.04	1.15	2.30	0.59	2.70	7.59	3.18	1.19	3.96	0.68	T.	24.59
Fort Hays	1.56	0.32	1.50	2.95	6.57	4.22	2.78	3.28	0.56	2.17	[1.50]	[0.00]	[27.41]
Fort Leavenworth	1.35	2.27	1.43	2.65	8.63	3.09	3.21	4.97	5.26	1.48	2.24	0.03	36.61
Fort Riley	1.11	0.21	2.87	2.03	6.45	1.52	6.92	4.00	1.73	2.13	1.50	T.	30.47
Fort Scott	......	......	......	......	7.50	9.00	2.75	0.75	......	......	......	......	......
Fremont (Atkin)	......	......	......	......	2.93	4.21	6.59	3.09	0.80	0.77	2.02	0.00	......
Gibson	1.20	0.69	1.18	1.92	2.28	0.49	1.20	1.18	0.90	[1.40]	[1.10]	[0.00]	[13.54]
Globe	0.94	2.04	2.68	3.26	7.34	3.48	5.85	4.74	4.20	1.04	2.61	0.06	38.24
Gognac	......	......	......	0.50	......	......	1.00	2.50	0.19	......	......	......	......
Gorham	......	......	......	......	......	1.82	5.40	......	0.25	......	3.00	0.00	......
Gove City (Lisbon)	1.20	0.12	1.50	[1.60]	2.50	0.86	0.65	3.41	0.06	2.00	0.40	0.00	[14.30]
Grainfield	0.70	[0.20]	1.00	[1.80]	6.50	4.75	1.10	2.50	0.50	1.70	0.20	0.00	[20.95]
Grenola	1.05	1.00	1.30	4.00	4.50	6.75	3.50	4.20	4.20	2.00	1.80	0.10	34.40
Grinnell	0.50	0.30	0.40	[1.80]	5.40	3.75	4.24	2.50	0.00	2.30	0.10	0.00	[21.29]
Halstead	0.73	0.20	1.46	3.83	5.47	6.71	2.99	2.54	2.79	1.99	1.35	0.00	30.06
Haven	0.77	0.35	2.25	4.75	5.25	7.25	......	4.50	......	......	......	......	......
Havensville	1.85	1.75	2.00	5.75	10.00	4.00	8.50	3.00	2.12	2.75	0.88	T.	42.60
Hays City	1.26	0.50	1.50	[1.95]	8.16	2.45	2.90	2.63	T.	2.57	1.45	0.00	[25.37]
Horton	......	......	......	1.63	6.15	2.79	6.13	2.87	1.60	2.23	......	T.	......
Hoxie	......	......	......	3.82	9.75	......	p5.28	0.12	......	......	......	......	......
Hugoton	1.10	......	0.75	2.60	0.20	......	2.70	......	......	......	......	......	......
Independence	2.15	1.98	3.42	6.68	6.62	4.03	7.40	0.37	7.29	2.20	1.88	0.53	44.55
Junction City	1.43	0.80	4.16	3.02	9.94	2.47	7.59	3.11	2.19	1.93	2.28	0.05	38.97
Kanopolis	[1.20]	0.31	1.33	2.00	8.37	4.50	4.45	1.10	0.10	2.70	0.45	0.00	[26.51]
Kellogg	......	......	......	......	......	......	......	3.50	4.45	2.15	2.50	0.27	......
Kirwin	0.88	0.02	2.01	2.70	3.65	2.06	11.30	1.57	0.50	0.40	1.18	0.00	26.27
La Harpe	1.25	1.96	2.77	3.46	6.36	6.19	4.68	1.48	5.30	2.53	1.73	1.04	38.75
Lakin	......	......	......	......	......	......	......	4.24	0.16	3.98	0.50	0.00	......
Lawrence	0.79	2.20	2.30	2.95	8.27	4.04	6.34	8.38	5.02	2.89	1.96	0.08	45.22
Leavenworth	1.06	2.56	1.32	2.80	9.90	3.01	3.02	7.09	5.73	1.59	2.77	0.08	40.93
Leavenworth Mil. Prison	[1.35]	2.30	1.39	2.80	8.35	2.55	3.39	4.77	6.06	1.11	2.24	0.07	[36.38]
Lebo	0.90	1.81	2.72	3.22	12.14	5.40	7.73	2.09	3.53	1.35	2.72	0.19	43.80

Leoti	*1.02*	*0.72*	*0.35*	*1.77*	*3.40*		*1.88*	*4.14*					
Luray					7.00	3.25	4.70	1.75	0.00			0.00	
McAllaster	0.30	0.30	[1.20]	[1.80]	1.90	5.27	3.35	4.10	0.50	0.80	0.05	0.00	[19.57]
McPherson	0.60	0.20	1.00	2.12	[4.20]	[5.20]	[3.20]	3.00	2.80	2.55	3.75	0.00	[28.62]
Macksville	1.75	0.25	1.43	6.00	5.50	1.50	4.62			3.80			
Manhattan (1)					6.55	4.01	9.59	2.77	2.13	2.18			
Manhattan (2)					6.15	3.56	8.14	2.48	1.92	1.42	2.23	0.02	
Manhattan (3)	0.86	0.54	1.97	1.67	6.25	3.54	10.28	2.75	2.03	1.40	2.47	0.00	33.76
Marmaton	[0.75]	[1.40]	[2.50]	3.10	7.40	8.85	3.05	1.85	5.30	2.46	1.77	0.82	[39.25]
Minneapolis						2.87	6.87	3.37	0.47				
Montero	0.40	0.40	0.50										
Monument	0.75	0.55	0.80	2.20	3.10	2.80	1.60	4.00	1.20	1.55	0.65	0.00	19.20
Morse	1.25	3.00	2.00	3.55	9.88	4.60	3.75	4.00	4.85	0.50	2.50	T.	39.88
Ness City				0.75	2.00	1.50		3.90					
Oakley	0.90	0.60	[1.20]	[1.80]	2.60	4.35	2.75	1.60	0.90	[1.90]	0.60	0.00	[19.20]
Oberlin	0.78	0.23	1.24	1.77	3.94	3.22	5.56	1.43	0.30	0.47	0.66	0.00	19.60
Offerle	[1.70]	[0.30]	2.08	3.40	1.65	2.47	2.40	1.89	1.02	5.77	0.66	T.	[23.34]
Ogallah		0.50			5.25	2.90	1.30	3.00		2.25	0.40	0.00	
Ottawa				3.46	4.88		4.40	5.53	3.95				
Quinter	[0.85]	0.50	[1.20]	[1.70]	7.00	2.81	1.12	0.75	0.65	1.12	0.37	0.00	[18.07]
Richfield								1.75	0.22	4.46	0.22	0.00	
Rome	0.61	1.03	2.04	4.52	5.70	6.18	7.33	5.40	4.64	1.19	0.52	0.02	30.18
Russell	[1.30]	0.80	0.35	2.25	7.71	1.50	4.70	2.50	0.00	3.30	[1.40]	0.00	[25.81]
Salina	1.40	0.40	1.86	3.52	8.92	2.75	4.83	2.22	2.25	2.00	2.55	T.	32.70
Santa Fé		0.35			0.90	4.10		0.90	1.20				
Scott City							1.68	1.87	0.00			0.00	
Sedan	2.08	1.50	3.19	6.13	11.01	4.44	7.84	0.80	10.59	2.37	2.23	0.71	52.89
Seneca	1.36	0.48	0.75	1.91	6.34	4.06	5.89	3.24	0.38	1.51	1.12	0.01	27.05
Sharon Springs	1.24	0.47	1.84	2.41	[3.10]	[3.60]	0.50	4.12	0.00	0.91	[0.50]	0.00	[18.69]
Shields	[0.90]	0.81	1.80	2.96	6.33	1.46	2.25	2.25	0.00	[2.00]	2.48	0.00	[23.26]
Stockton						5.54	9.57	1.25	0.00				
Topeka	0.63	1.84	2.03	2.89	6.08	3.08	8.11	6.48	4.28	1.34	2.15	0.05	38.96
Tribune	1.11	0.57	0.63	1.64	0.69	5.26	0.98	2.54	0.07	2.37	0.25	0.01	16.12
Vesper				1.46	7.06	3.45		3.50	1.49			T.	
Victoria	0.27	0.41	0.30	[2.10]	3.85	1.77	2.67	1.70	T.	2.05	1.20	0.00	[16.32]
Wa Keeney		0.50					1.70	3.25	0.05		1.05	0.00	
Wakefield	1.70	0.38	2.57	3.54	8.45	3.14	7.35	2.21	1.80	3.43	1.72	0.00	36.29
Wallace	0.51	0.23	1.72	1.29	1.27	3.40	2.17	2.50	0.05	1.26	0.15	0.00	14.55
Walnut Grove	1.20	0.30	2.00	1.90	0.80	2.70	2.35	1.60					
Wellington	0.96	1.00	2.97	4.79	3.29	5.57	7.99	3.91	3.77	2.21	1.70	T.	38.16
Weskan					1.40	2.30	0.20	2.70	0.00		0.30	0.00	

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Kansas—Continued.													
Wichita	0.82	0.57	2.41	5.18	3.88	7.89	4.72	3.79	2.10	2.14	1.14	0.03	34.67
Wilson	1.26	0.15	1.07	5.49	6.42	1.15	4.22	0.50	0.45	2.86	2.13	0.00	25.70
Winfield	....	1.20	....	4.63	....	5.63	5.43	3.81	5.85	....	....	....	....
Winona	0.40	0.40	3.00	[2.10]	2.33	3.95	3.30	4.20	0.83	2.00	0.40	0.00	[22.91]
Yates Centre	1.17	1.37	2.72	3.64	4.56	5.69	6.00	0.83	5.15	1.77	2.15	0.15	35.20
Kentucky:													
Ashland	3.40	1.42	2.00	2.97	4.54	4.03	4.12	1.12	3.01	4.25	4.03	1.87	36.76
Bernstadt	....	2.58	2.33	3.76	3.26	5.21	7.17	2.00	....	....	....	....	....
Bowling Green	2.79	2.34	1.64	2.54	4.57	6.04	8.75	2.02	4.29	1.62	7.90	1.92	46.42
Burnside	4.83	2.55	3.40	3.68	4.82	4.83	6.16	1.00	5.29	2.10	5.60	2.64	46.90
Canton	....	....	....	....	....	....	3.05	3.32	6.31	1.15	6.98	1.10	....
Catlettsburgh	4.38	1.41	1.61	2.48	4.40	4.69	3.81	1.20	3.08	3.19	3.65	1.82	35.72
Earlington	....	....	....	....	....	....	5.46	2.92	4.86	0.84	7.43	1.25	....
Eddyville	3.02	1.11	1.04	0.99	3.64	6.56	3.60	0.90	4.69	1.69	5.68	0.88	33.80
Falmouth (1)	3.36	2.05	0.69	1.22	2.96	6.81	[4.60]	0.78	4.05	3.31	5.89	1.37	[37.09]
Falmouth (2)	3.69	1.90	1.44	1.31	2.46	7.15	4.65	0.83	3.31	3.32	5.84	1.70	37.60
Frankfort (1)	2.71	2.10	0.92	1.44	3.65	4.71	8.20	0.90	7.01	1.29	6.36	2.07	41.36
Frankfort (2)	3.30	2.25	1.05	1.33	4.10	4.82	8.59	0.99	7.01	1.65	6.82	2.36	44.27
Franklin	3.58	2.23	1.91	2.08	5.44	5.36	6.87	2.83	3.53	1.81	7.13	1.91	44.68
Greensburgh	4.11	1.85	1.22	2.28	4.00	3.83	9.92	1.75	3.30	3.14	7.20	1.70	44.30
Lexington	5.66	1.78	1.63	1.52	3.53	3.49	5.82	1.15	6.79	3.06	5.34	1.73	41.50
Louisa	3.00	1.60	0.21	1.50	5.00	4.15	[4.10]	0.64	5.20	2.72	6.18	1.28	[35.58]
Louisville	3.07	2.33	0.95	0.65	5.26	5.76	2.98	0.23	4.38	1.68	5.99	1.74	35.02
McHenry	....	....	1.16	1.00	3.49	7.39	4.36	....	....	....	....	....	....
Madisonville	3.27	1.66	1.53	1.25	3.52	4.83	2.88	....	....	....	....	....	....
Millersburgh	2.71	1.87	1.92	1.36	....	....	....	....	6.60	1.50	6.21	0.75	....
Mount Sterling	4.46	0.88	1.82	1.97	3.44	7.70	5.42	1.01	2.47	3.65	4.63	1.44	38.89
Murray	....	....	....	....	....	....	....	1.14	6.06	2.68	4.92	0.63	....
Newport Barracks	2.90	1.61	0.81	1.00	6.94	4.56	4.21	0.52	3.75	2.71	6.28	2.04	37.33
Owenton	2.32	2.03	0.87	1.20	7.01	3.64	d6.45	0.32	4.52	1.50	6.64	2.20	38.70
Paducah	3.64	1.61	1.92	1.34	4.48	5.19	4.91	0.45	5.69	0.72	5.46	0.89	36.30
Pellville	2.71	1.45	1.09	0.93	3.65	5.39	6.20	1.06	4.23	1.55	6.09	2.24	36.59
Richmond	3.67	1.36	2.98	0.51	3.92	3.40	6.48	2.50	5.32	4.05	4.32	1.08	39.59

Shelbyville	*3.05*	*2.49*	*0.93*	*1.09*	*4.36*	*8.04*	*8.41*	*1.05*	*7.29*	*2.42*	*6.73*	*2.17*	*48.03*
South Fork	5.80	1.90	4.30	2.55	5.30	1.88	2.03	0.79	12.40	5.10	3.50	0.11	45.66
Springfield	......	......	......	......	......	5.20	6.81	0.30	4.10	2.10	6.95	2.30	......
Williamsburgh	3.95	[2.00]	1.77	3.73	4.10	3.00	4.90	2.26	5.77	2.50	5.73	5.15	[44.86]
Louisiana:													
Abbeville	5.23	1.90	3.44	1.18	1.56	8.01	7.49	5.31	[1.80]	0.02	3.19	1.63	[40.76]
Alexandria	5.81	1.04	3.86	2.20	1.19	14.58	6.74	0.75	0.33	0.17	4.84	0.92	42.43
Amité City	7.05	2.14	5.79	3.62	0.44	8.16	5.85	5.88	1.95	0.32	2.72	1.20	45.12
Arcadia	5.50	2.40	4.15	4.85	......	......	......	......	......	......	......	......	......
Baton Rouge	6.24	2.07	3.60	3.66	0.46	5.07	......	8.04	......	......	2.80	......	......
Cameron	[7.20]	2.10	3.16	3.69	0.46	3.43	8.52	4.02	3.05	0.15	4.36	2.52	[42.66]
Cheneyville	4.15	......	......	......	1.02	10.19	2.68	1.00	1.50	0.08	2.60	......	......
Clinton	7.10	2.15	4.60	2.83	0.87	8.84	6.96	5.49	2.40	T.	3.29	1.69	46.22
Convent	6.50	3.73	3.14	1.35	1.33	10.95	5.20	2.34	[1.20]	0.07	[2.40]	[1.60]	[39.81]
Coushatta Chute (1)	5.85	0.99	5.81	3.16	3.71	6.83	5.77	1.54	1.78	0.47	7.79	0.84	44.54
Coushatta Chute (2)	......	......	......	......	3.11	6.42	4.36	1.10	1.24	0.57	7.47	0.89	......
Crowley	6.15	1.25	3.21	0.98	0.40	15.51	4.85	2.56	1.35	0.00	3.62	1.76	41.64
Delhi	5.50	1.20	4.45	3.00	1.40	5.40	8.12	3.10	2.00	1.50	7.05	1.90	44.62
Donaldsonville	[6.40]	3.10	5.40	1.47	1.00	5.17	[5.20]	3.64	0.94	0.15	3.30	1.45	[37.22]
Emilie (Mount Airy)	5.68	3.27	3.03	1.12	0.55	6.04	4.42	4.13	2.75	T.	3.57	0.50	35.26
Farmerville	4.05	1.10	2.62	6.45	0.20	4.75	6.30	0.47	0.80	0.75	6.05	0.75	34.29
Franklinton	6.46	3.18	5.37	4.05	0.12	4.16	5.30	2.35	2.55	[0.15]	[3.00]	[1.30]	[37.99]
Girard	2.45	0.77	4.02	3.62	2.67	6.30	5.94	1.18	2.25	0.40	6.75	2.18	38.53
Grand Cane	3.60	1.00	4.20	4.50	3.00	6.10	6.10	[1.50]	4.70	0.80	8.10	0.60	[44.20]
Grand Coteau	5.70	1.53	3.69	2.66	0.21	4.90	4.28	5.13	2.13	T.	2.85	3.75	36.83
Hammond	5.26	2.61	4.30	2.69	0.13	[8.00]	8.05	8.36	2.98	0.00	4.44	0.84	[47.66]
Houma	7.23	4.20	3.80	1.41	0.81	8.16	10.49	6.22	6.80	0.28	3.25	1.62	54.27
Jackson Barracks	[6.40]	2.82	4.69	2.30	1.53	4.49	2.28	4.42	[6.40]	[0.26]	1.53	0.47	[37.59]
Jeanerette	[6.00]	[3.50]	[3.30]	2.89	0.16	9.35	8.04	4.78	2.93	T.	3.40	2.12	[46.47]
Jennings	6.70	......	3.60	0.06	0.08	1.01	2.40	......	......	......	......	......	......
La Fayette	[6.60]	[1.35]	[3.30]	2.78	0.31	12.40	6.30	7.78	1.11	0.00	3.64	2.45	[48.02]
Lake Charles	7.15	1.45	3.10	3.42	0.30	7.80	3.50	3.10	1.10	0.10	3.50	1.85	36.37
Lake Providence	5.02	1.28	3.74	3.24	0.92	13.88	......	2.92	......	......	......	......	......
Liberty Hill	5.08	1.22	4.54	4.86	1.49	10.35	5.64	0.88	1.45	0.46	7.18	1.71	44.86
Luling	6.78	3.08	3.36	3.32	0.02	5.53	4.62	4.98	3.42	0.34	3.53	0.71	39.69
Mandeville	6.04	3.51	3.48	1.72	1.09	4.03	3.26	5.48	1.64	0.00	3.98	0.39	34.67
Marksville	4.41	1.37	1.34	1.75	1.50	10.33	3.75	1.51	2.32	0.15	3.43	1.08	32.94
Maurepas	5.95	[2.00]	4.70	1.00	1.06	8.65	4.78	3.68	2.75	0.00	3.17	1.30	[39.04]
Minden	4.00	1.44	2.30	[5.20]	2.00	4.09	2.13	0.05	1.18	0.07	4.24	1.03	[27.73]
Monroe	4.17	0.89	4.05	5.24	0.82	7.98	9.55	0.31	1.84	0.44	6.58	1.56	43.43
Natchitoches	......	......	......	......	2.02	9.87	3.72	1.62	1.69	0.55	8.30	......	......

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Louisiana—Continued.													
New Iberia	6.11	1.91	3.28	2.72	0.26	8.61	5.72	[3.00]	0.31	0.00	1.20	1.59	[34.74]
New Orleans	6.51	2.78	3.86	2.28	1.17	7.62	9.13	5.59	6.40	0.26	2.18	0.67	48.45
Plaquemine	6.94	2.41	3.06	2.45	0.50	5.83	4.30	8.23	2.82	0.30	2.37	1.44	40.65
Pointe à la Hache	......	......	......	......	......	11.86	6.61	6.93	5.75	T.	5.85	2.00	......
Port Eads	6.24	3.40	5.46	1.17	2.40	6.42	8.64	4.66	2.10	0.02	2.05	0.20	42.76
Rayville	4.00	0.55	2.87	4.80	......	5.13	......	......	......	......	......	......	......
St. Joseph	5.50	1.13	4.54	2.75	......	4.29	4.63	......	......	......	......	......	......
Shell Beach	[6.40]	[1.60]	2.45	0.90	[0.40]	7.80	4.50	3.40	0.50	0.00	4.80	1.95	[34.70]
Shreveport	4.02	2.03	3.05	6.91	2.70	7.97	3.43	1.75	3.51	1.06	9.10	0.64	46.17
Sugar Experiment Station	8.20	3.21	1.80	3.28	0.76	9.41	7.45	4.64	5.30	0.00	2.79	......	......
Thibodeaux	6.45	3.42	2.52	2.23	[0.30]	7.89	4.13	5.35	4.40	0.17	2.28	0.88	[40.02]
Trinity	3.00	[1.20]	[2.09]	2.90	1.50	4.70	5.40	2.10	1.70	0.60	3.60	1.20	[29.90]
Vidalia	3.83	1.08	3.36	3.03	0.68	6.17	7.48	2.44	0.40	0.18	3.36	1.00	33.01
West Melville	5.56	1.91	2.18	2.10	0.55	5.43	5.05	6.17	0.70	0.46	1.78	2.71	34.60
Winnfield	......	......	......	......	......	5.07	10.38	1.87	1.69	0.44	......	......	......
Maine:													
Bar Harbor	4.83	3.88	4.42	2.81	1.79	2.04	2.07	1.17	1.65	5.86	6.25	5.92	42.69
Calais	4.17	[3.60]	3.59	3.02	1.81	3.33	3.24	2.87	1.93	4.72	[4.00]	4.43	[40.71]
Cornish	5.10	3.00	3.17	2.34	2.31	3.13	4.47	2.50	4.16	4.41	5.24	3.13	42.96
Eastport	3.44	4.13	4.06	3.19	2.20	2.85	3.69	2.00	2.52	5.02	4.60	4.56	42.26
Fairfield	2.91	2.12	3.09	1.06	2.54	4.25	3.11	1.74	1.95	3.57	5.13	4.26	35.73
Fort Preble	[3.47]	[2.74]	[2.68]	[2.39]	2.27	3.15	4.63	3.40	2.50	3.85	8.85	5.15	[45.08]
Gardiner	5.20	1.84	2.76	2.38	2.54	[3.80]	2.96	1.60	2.55	4.59	5.44	5.51	[41.17]
Kennebec Arsenal	2.12	1.30	2.42	0.00	4.35	3.15	3.21	1.20	0.21	2.92	5.48	2.83	29.19
Kent's Hill	3.78	3.45	2.95	2.07	3.80	4.08	6.50	2.12	3.42	5.74	4.85	2.93	45.69
Lewiston	4.67	3.21	3.30	2.48	2.85	4.12	5.22	2.68	2.92	4.61	6.25	5.00	47.31
Mayfield	[4.00]	[3.20]	[4.00]	2.09	3.66	5.70	4.98	3.35	6.52	5.83	5.39	[4.10]	[52.82]
Orono	5.37	5.20	4.62	1.93	1.86	4.93	3.23	1.65	2.21	4.04	4.50	3.40	42.94
Portland	3.47	2.74	2.68	2.39	2.65	3.26	3.10	2.76	2.49	3.47	7.95	4.96	41.92
Maryland:													
Baltimore	4.22	2.53	5.71	8.70	6.82	6.17	11.03	1.40	4.59	4.12	6.45	0.61	62.35
Barren Creek Springs	3.97	3.74	6.76	6.45	7.19	5.40	12.48	1.32	3.79	5.56	6.36	0.19	63.21
Cumberland (1)	3.01	2.07	3.52	3.22	7.02	3.10	2.74	1.52	4.16	2.84	5.34	1.63	40.17

Cumberland (2)	......	......	......	......	*5.26*	*2.94*	......	......	......	*2.31*	*4.42*	*2.06*	......
Fallston	5.40	2.22	5.57	7.77	6.33	6.45	12.37	[1.50]	8.65	5.02	8.13	0.71	[70.12]
Fort McHenry	5.76	2.60	5.52	9.33	11.98	5.22	10.18	1.17	4.96	3.31	6.03	0.32	66.38
Frederick	3.87	2.18	5.16	3.41	9.51	3.43	7.60	1.11	4.06	4.51	6.33	0.66	51.83
Galena	4.49	2.48	4.45	5.97	6.08	5.84	8.46	2.09	4.63	4.75	10.17	0.55	59.96
Gambrill's	......	......	......	......	......	......	13.02	6.40	4.15	2.81	4.17	0.12	......
Jewell	2.73	2.95	5.47	12.20	7.28	5.10	10.25	1.67	5.25	6.25	6.55	T.	65.70
McDonogh	3.49	2.37	4.97	4.83	7.59	6.15	9.52	1.37	6.49	4.93	7.78	1.82	59.91
Mount St. Mary's	4.84	1.24	6.04	4.17	10.20	[5.10]	[9.50]	[2.00]	6.45	3.38	6.63	1.82	[61.37]
Woodstock College	3.85	2.18	2.18	6.15	10.34	2.29	5.90	1.43	[4.00]	3.81	6.54	0.63	[49.30]
Massachusetts:													
Amherst (1)	3.50	1.46	1.02	3.22	4.18	5.40	9.49	3.16	4.26	4.14	6.55	2.92	49.30
Amherst (2)	3.29	1.45	1.46	2.42	4.15	3.85	8.35	2.69	2.90	4.10	6.21	2.85	43.72
Amherst (3)	[3.29]	[1.45]	1.43	2.87	4.71	5.01	9.09	2.72	3.17	4.58	6.04	3.57	[47.93]
Beverly Farms	6.40	......	3.26	......	......	......	9.02	5.93	3.84	......	......	......	......
Blue Hill (base)	6.47	2.02	2.25	4.44	4.69	5.23	8.24	3.53	4.89	5.15	6.16	2.23	55.30
Blue Hill (valley)	6.81	1.72	2.36	3.92	4.47	5.17	8.47	3.79	4.61	4.98	5.64	2.25	54.19
Blue Hill (summit)	6.11	1.81	2.62	4.13	4.67	5.60	8.47	3.61	5.25	5.20	5.49	2.24	54.60
Boston (1)	4.11	1.54	1.19	3.07	4.15	2.77	5.80	3.95	3.19	3.31	4.91	1.83	39.82
Boston (2)	6.18	2.00	2.42	3.98	4.93	4.18	8.44	4.46	4.28	4.19	5.83	2.36	53.25
Brewster	4.55	4.07	3.66	4.70	4.25	1.39	3.43	6.30	2.94	5.43	5.67	2.28	48.67
Cambridge (1)	6.64	2.81	3.29	3.73	5.65	3.44	8.53	3.78	5.30	3.72	6.51	3.30	56.70
Cambridge (2)	6.01	1.44	1.05	2.54	5.39	2.53	6.42	3.27	4.30	3.65	4.97	2.22	43.79
Chestnut Hill	6.50	1.93	2.17	4.02	4.78	3.31	9.23	4.81	5.30	3.83	6.25	2.66	54.79
Chicopee	......	......	......	2.78	......	......	5.61	3.21	5.32	......	7.45	3.39	......
Clinton	5.03	1.12	1.75	3.76	2.43	0.86	7.28	2.92	5.35	3.55	5.87	2.12	42.04
Cotuit	4.22	3.71	3.56	4.44	4.19	2.65	4.09	5.20	3.03	5.58	5.44	2.34	48.45
Deerfield	4.01	1.72	1.47	2.40	3.88	......	......	......	......	......	......	......	......
Dudley	2.75	1.31	1.16	2.55	2.74	2.11	3.39	2.05	4.02	4.20	4.10	2.80	33.18
Fall River (1)	8.45	2.68	5.70	4.95	5.31	2.87	6.20	6.10	4.92	5.51	8.29	2.55	63.53
Fall River (2)	7.64	2.95	3.39	5.26	[5.30]	[2.30]	5.22	[4.50]	[3.50]	5.39	9.57	3.20	[58.22]
Fiskdale	3.53	1.98	1.85	2.45	2.31	3.02	8.72	2.98	2.49	5.40	4.88	2.63	42.24
Fitchburg (1)	4.86	1.84	1.83	3.07	3.34	2.92	7.35	3.02	3.77	5.77	6.74	3.48	47.99
Fitchburg (2)	5.73	1.72	1.94	3.12	3.28	2.62	7.17	2.31	3.35	5.08	6.22	3.22	45.76
Fort Warren	3.83	1.30	1.60	4.72	3.30	3.89	7.87	4.26	3.47	2.94	5.73	1.64	44.55
Framingham	5.39	1.65	2.46	3.59	4.05	3.42	9.34	4.49	4.24	4.65	6.28	3.15	52.71
Gilbertville	4.73	1.13	2.99	2.03	2.53	4.18	9.63	6.35	4.28	5.35	5.91	3.92	53.03
Groton	4.35	1.45	1.47	3.27	3.32	2.03	6.91	2.88	3.33	4.79	6.67	3.05	43.52
Holyoke	3.94	1.53	2.02	2.14	4.07	3.66	8.86	1.92	4.64	4.20	5.89	2.76	45.63
Lake Cochituate	5.46	1.56	2.28	3.17	3.64	3.17	9.10	4.41	4.92	3.85	5.79	2.70	50.05
Lawrence	5.21	1.65	2.03	4.12	4.33	3.43	7.04	3.00	3.32	4.21	6.48	3.22	48.04

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Massachusetts—Continued.													
Leicester	3.87	1.43	1.22	3.97	3.04	3.01	9.62	3.46	3.51	4.26	5.89	3.03	46.31
Leominster	4.99	1.72	1.67	2.97	4.31	2.42	8.03	3.68	3.05	5.39	6.45	3.54	48.22
Long Plain	7.42	2.69	4.21	5.51	5.17	3.03	5.17	6.82	3.68	6.10	8.77	2.71	61.28
Lowell (1)	5.04	1.71	1.99	3.63	3.89	2.59	6.12	3.97	3.26	4.26	6.94	3.37	46.77
Lowell (2)	4.74	1.72	1.95	2.16	3.14	2.36	6.22	3.18	3.20	4.42	6.28	2.06	41.43
Ludlow	3.97	1.97	2.09	2.73	3.57	4.37	9.05	2.38	4.04	5.08	6.13	3.45	48.83
Lynn	6.43	2.33	2.57	[3.60]	4.50	4.70	8.75	5.04	3.43	5.03	6.65	2.97	[56.03]
Mansfield	6.21	2.48	1.96	4.70	4.41	3.72	10.60	4.16	5.25	5.62	6.50	3.43	59.04
Medford	5.47	1.71	1.60	4.12	4.46	3.51	8.46	4.06	4.90	4.31	6.22	2.20	51.02
Middleborough	6.15	2.56	2.38	4.47	4.05	2.42	6.74	5.39	3.62	4.68	6.69	2.35	51.50
Milton	6.90	2.04	2.73	3.95	3.90	4.83	9.30	3.42	4.87	4.66	4.94	2.36	53.90
Monson	[4.30]	[1.60]	[2.10]	2.87	1.95	3.16	8.12	2.76	2.72	6.21	5.51	3.31	[44.61]
Mount Nonotuck	[3.50]	[1.60]	[2.10]	2.08	3.84	5.36	9.43	2.32	4.84	3.05	6.92	3.18	[48.22]
Mystic Lake	5.88	1.90	2.36	3.63	4.72	3.36	8.36	3.66	4.80	3.71	6.24	2.92	51.54
Mystic Station (1) (engine house)	5.57	1.80	2.25	3.65	4.64	3.43	8.09	4.11	4.86	3.88	5.88	2.83	50.99
Mystic Station (2)	5.13	1.82	2.21	3.59	4.56	3.27	8.10	4.18	4.61	3.47	5.06	2.80	48.80
Nahant						5.72	6.28	4.75	3.01				
Nantucket	5.03	4.23	5.46	4.02	2.26	3.45	2.92	11.05	3.12	6.58	7.80	2.07	57.99
Natick	8.85	2.21	5.28	3.67	3.82	2.71	9.27	4.58	4.45	3.75	5.76	2.97	57.32
New Bedford (1)	5.91	2.75	2.69	4.22	5.40	3.52	7.51	3.58	4.12	3.88	6.59	2.62	52.79
New Bedford (2)	5.88	3.00	2.88	4.32	5.06	3.76	5.45	5.60	3.93	3.96	6.22	2.63	52.69
Newburyport (1)	5.89	2.30	3.20	3.55	4.13	4.35	6.79	2.89	2.82	4.71	8.15	2.63	52.69
Newburyport (2)	4.63	2.34	2.72	3.77	6.45	4.08	7.01	2.20	2.75	4.92	8.15	3.52	52.30
Northampton	4.46	1.81	1.53	2.63	4.00	7.17	9.44	2.62	5.16	4.15	7.30	2.89	51.91
North Billerica	5.10	1.56	1.62	3.81	5.10	4.92	7.18	4.14	3.14	3.38	6.78	3.29	53.56
Plymouth	4.96	2.61	2.72	6.66	3.20	2.85	6.32	6.54	2.57	3.29	6.02	2.30	49.03
Princeton	5.99	1.12	1.82	4.30	4.47	2.71	8.76	4.72	3.32	4.85	5.99	1.30	49.04
Provincetown	3.52	4.04	2.32	[3.70]	[4.10]	1.82	4.30	6.86	2.20	4.95	4.71	2.87	50.92
Randolph	6.45	2.15	2.31	4.64	4.34	3.60	6.85	2.30	5.08	5.47	6.81	[2.90]	[45.42]
Rowe	4.85	1.20	2.30	2.80								2.79	52.79
Royalston	5.58	[1.70]	3.18	3.50	6.62	6.38	12.38	2.50	[3.80]	5.25	7.22	7.98	[66.09]
Salem	5.23	2.07	1.66	3.60	3.11	3.89	6.77	[4.20]	2.80	3.84	6.15	2.82	[46.14]

Somerset	*6.20*	*2.12*	*2.74*	*4.84*	*5.79*	*3.13*	*6.38*	*6.19*	*3.74*	*4.40*	*8.91*	*2.37*	*56.81*
South Hingham	*7.43*	*2.28*	*2.82*	*4.13*	*3.37*	*3.57*	*7.52*	*4.45*	[4.20]	[3.50]	*6.11*	*2.47*	[51.85]
Springfield (Nat'l Armory)	3.92	*1.71*	1.57	2.28	4.31	3.68	9.08	2.39	4.28	4.67	5.66	3.17	46.72
Taunton (1)	6.13	2.22	1.96	4.62	4.06	1.94	8.46	7.39	3.02	4.75	6.69	2.55	53.79
Taunton (2)	6.33	2.14	2.65	4.75	5.10	2.08	9.68	7.74	3.69	4.39	6.77	2.69	58.01
Taunton (3)	6.43	2.21	2.08	4.34	5.67	2.02	7.92	7.34	[3.70]	4.44	6.59	2.68	[55.42]
Vineyard Haven	3.11	3.72	1.90	3.15	4.45	2.35	2.57	4.86	2.94	2.78	4.73	1.76	38.32
Waltham	6.24	1.53	2.03	4.35	5.35	3.29	9.90	3.50	4.26	3.62	6.08	2.94	53.09
Wellesley	5.92	1.79	4.95	5.36	4.62	3.43	9.21	4.37	3.80	4.03	6.39	2.68	56.55
Westborough	5.38	1.63	2.03	3.47	1.84	2.18	8.54	3.86	4.34	4.12	6.30	2.76	46.45
Williamstown	2.96	1.22	1.10	2.31	1.78	5.08	5.81	2.94	2.39	2.95	4.20	3.30	36.04
Winchester	5.13	1.82	3.01	4.31	4.54	3.27	7.92	4.18	4.61	3.47	5.06	2.80	50.12
Wood's Holl	3.91	4.39	2.87	4.44	5.33	1.96	3.63	4.21	3.37	4.49	5.45	2.06	46.11
Worcester	5.64	1.83	2.52	4.02	3.78	2.40	8.23	3.51	3.45	3.54	5.97	3.26	48.15
Michigan:													
Adamsville	[1.90]	[2.20]	1.53	0.86	5.60	4.33	4.05	0.88	1.75	1.15	3.85	3.05	[31.15]
Adrian	1.79	1.18	1.39	0.62	6.33	4.48	4.11	0.99	0.96	1.27	1.66	3.11	27.89
Albion (1)	1.62	1.36	2.12	1.29	4.95	5.71	......	......	......	......	......	2.94	......
Albion (2)	......	......	......	......	7.05	5.58	1.87	0.40	1.07	1.37	4.99	3.50	......
Allegan	1.77	1.83	1.34	2.28	3.95	6.82	3.65	0.13	3.94	1.67	2.96	2.49	32.83
Alma	2.57	1.77	0.51	1.27	3.39	4.59	3.32	0.59	0.93	1.26	2.83	3.47	26.50
Alpena	3.26	2.33	0.21	1.55	3.81	4.61	2.04	2.02	2.84	1.70	4.05	2.90	31.32
Ann Arbor	[2.20]	[1.40]	[1.60]	0.81	4.56	4.05	2.74	0.34	1.35	0.80	2.60	3.61	[26.06]
Arbela	2.16	1.68	0.85	[1.10]	3.43	3.70	1.92	0.16	0.75	1.04	3.26	3.05	[23.10]
Atlantic Mine	3.80	1.43	1.00	3.05	1.41	2.49	3.79	2.83	2.63	0.33	1.53	2.50	26.99
Ball Mountain	[2.20]	[1.20]	[0.60]	[1.30]	3.85	2.00	1.23	1.32	0.70	0.56	1.76	2.68	[19.40]
Bear Lake	3.62	2.25	0.15	2.21	3.87	3.44	3.51	2.47	3.74	0.58	2.31	3.21	31.36
Bell Branch	1.72	[1.20]	0.79	0.97	4.81	3.64	1.69	0.56	0.95	1.11	2.68	2.69	[22.81]
Benton Harbor	1.86	3.16	1.75	2.16	4.78	[4.40]	[4.80]	[0.90]	3.80	1.32	3.78	2.05	[34.76]
Benzonia	2.59	3.97	0.34	2.08	3.94	3.71	2.06	......	......	......	......	......	......
Berlin	2.39	1.21	1.08	1.55	4.74	1.24	1.93	0.88	[1.10]	1.07	3.13	2.94	[23.26]
Berrien Springs	[2.00]	2.75	1.80	1.40	7.06	2.72	5.88	1.06	4.45	2.35	4.03	2.94	[38.44]
Big Rapids	1.86	2.59	0.30	1.51	3.98	3.93	1.60	0.23	2.72	0.65	2.34	4.91	26.62
Birmingham	2.43	1.90	0.42	1.77	4.86	2.27	1.00	0.77	1.20	1.20	3.37	2.63	23.82
Bronson	1.13	1.21	2.11	0.94	4.54	5.31	4.35	0.77	1.13	1.46	3.02	1.91	27.88
Buchanan	3.01	1.65	2.27	1.35	6.84	5.35	5.20	1.04	3.13	1.68	5.60	2.79	39.91
Calumet	2.83	1.94	0.53	4.26	2.06	2.07	3.09	4.44	3.86	0.37	1.68	4.06	31.19
Cassopolis	2.05	2.62	1.44	1.35	5.76	6.35	3.82	0.77	2.00	1.17	4.38	2.59	34.30
Charlevoix	[2.00]	[0.15]	0.04	0.86	3.83	4.65	2.35	2.06	5.19	0.43	2.84	0.91	[25.31]
Chase	1.51	1.05	0.15	[1.60]	4.19	5.04	1.40	1.01	3.19	0.50	2.44	3.12	[25.20]
Chelsea	1.97	1.45	1.64	1.54	3.61	3.15	1.83	0.30	[0.70]	0.83	3.36	3.25	[23.63]

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Michigan—Continued.													
Clinton	2.23	0.95	1.68	......	4.64	......	......	......	......	0.98	2.51	......	......
Colon	1.65	1.57	2.09	0.80	4.30	5.62	6.83	0.80	1.33	1.32	4.10	2.27	32.68
Columbiaville	......	......	......	......	......	......	......	0.32	0.99	0.97	2.25	......	......
Concord	1.50	0.93	1.68	0.92	6.52	4.08	2.96	0.80	0.74	1.30	3.80	2.01	27.24
Deer Lake	2.25	2.65	0.30	1.68	0.90	4.90	1.53	0.83	2.11	0.35	2.40	4.67	24.57
Detroit	1.51	0.76	1.17	1.14	4.41	3.28	1.54	0.19	0.56	1.05	2.36	3.09	21.06
East Saginaw	2.21	2.33	0.56	0.63	......	......	......	......	......	......	......	......	......
East Tawas	[1.80]	1.80	[0.20]	0.61	4.72	1.47	[1.50]	[1.40]	0.62	1.27	4.29	2.43	[22.11]
Eden	1.59	1.28	1.25	1.76	2.77	4.15	1.52	0.36	[1.10]	[1.00]	2.62	2.17	[21.57]
Escanaba	1.54	1.67	0.48	1.86	2.55	5.98	2.36	2.70	2.68	1.10	1.04	2.81	26.77
Evart	[1.60]	[2.00]	[0.20]	0.75	2.22	3.40	1.13	1.84	2.83	0.32	1.97	2.48	[20.74]
Fitchburgh	2.13	1.34	1.33	1.57	3.98	3.24	2.04	0.30	0.73	0.55	4.14	3.16	24.51
Flint	1.41	1.62	0.67	1.25	3.09	3.38	2.34	0.14	0.84	1.16	2.99	2.95	21.84
Fort Brady	2.19	2.12	0.31	1.47	2.45	5.98	3.10	2.77	4.93	1.74	1.75	2.80	31.61
Fort Mackinac	[2.30]	1.39	0.26	0.79	3.26	8.42	2.62	3.48	4.34	1.29	3.13	3.50	[34.69]
Fort Wayne	1.96	2.26	1.49	1.42	5.49	3.84	1.69	0.30	0.72	0.57	2.37	3.81	25.92
Fremont	2.03	2.23	0.44	[1.90]	3.18	4.77	2.20	0.64	1.69	0.49	2.27	4.36	[26.20]
Gaylord	......	......	0.19	......	......	......	2.47	2.16	......	......	1.72	......	......
Gladwin	2.18	2.00	0.15	0.80	2.09	[4.00]	[1.70]	[0.30]	1.61	0.40	3.84	2.52	[21.59]
Grand Haven	1.61	2.80	0.40	1.75	4.01	4.21	2.23	0.56	2.88	0.47	2.34	3.17	26.43
Grand Rapids	3.46	[1.30]	0.45	1.90	3.43	5.78	2.38	0.83	2.34	0.48	1.41	3.49	[27.25]
Grape	1.38	0.66	1.78	0.69	4.45	4.50	[3.70]	0.70	1.69	0.87	3.24	2.87	[26.53]
Grayling	[1.70]	[1.40]	[0.10]	[1.40]	2.85	4.05	3.55	1.95	3.79	0.70	2.23	4.66	[28.38]
Gulliver Lake	3.17	3.42	0.31	1.95	2.69	[5.90]	2.45	3.60	[2.60]	0.39	1.60	3.86	[31.94]
Hanover	1.45	1.12	2.15	0.86	4.84	4.80	2.98	0.51	1.32	0.99	2.99	1.67	25.68
Hart	2.50	2.58	0.35	2.20	4.70	4.50	2.90	0.80	2.55	0.70	2.70	2.30	28.78
Harrisville	3.43	2.62	0.20	1.16	5.38	3.83	1.55	1.44	2.02	1.61	5.11	4.34	32.69
Hastings	1.62	1.49	1.41	1.53	3.38	4.66	1.52	0.10	1.57	0.97	2.35	2.70	23.30
Hayes	1.00	1.40	0.25	......	2.60	......	......	......	......	......	2.59	3.36	......
Highland Station	1.60	0.87	1.02	1.46	5.30	3.06	1.16	1.38	0.35	0.73	2.36	2.45	21.74
Hillman	2.15	0.71	0.19	1.53	3.50	4.13	1.02	2.06	2.94	1.22	3.07	2.06	24.58
Hillsdale	1.26	[1.50]	1.64	0.99	4.15	2.15	3.54	0.54	1.19	1.21	2.56	2.37	[23.10]
Hudson	1.89	1.73	1.91	0.39	5.24	3.79	4.07	0.46	1.06	1.49	2.82	2.24	27.09

Ionia	*3.26*	*1.11*	*0.24*	*1.39*	*3.47*	*[4.60]*	*2.70*	*0.61*	*1.33*	*[0.70]*	*[2.70]*	*3.77*	*[25.88]*
Ivan	......	......	......	......	*3.00*	*4.66*	*1.89*	*0.87*	*4.17*	*0.98*	*3.17*	*3.71*	......
Jeddo	2.01	0.86	0.85	0.83	2.81	2.36	1.59	0.42	1.39	1.44	2.36	4.03	20.95
Kalamazoo	1.46	1.35	1.84	1.11	4.86	4.94	4.82	0.31	1.90	1.41	2.20	2.30	28.50
Kenockee	2.05	1.70	0.53	1.85	......	......	......	......	......	......	......	......	......
Lansing (1)	1.93	1.25	1.13	1.82	3.63	4.14	2.62	0.79	0.85	0.79	2.51	2.75	24.21
Lansing (2)	1.67	1.02	1.14	1.70	3.86	3.65	2.67	0.18	0.83	0.75	2.59	2.68	22.74
Lathrop	1.74	1.88	0.46	2.42	2.31	4.49	3.02	3.11	2.94	0.83	2.34	2.84	28.38
Madison	1.97	1.07	1.93	0.79	4.30	3.84	4.25	0.60	1.13	1.09	2.49	2.77	26.23
Manchester	1.46	[1.20]	1.59	0.67	4.85	3.83	[2.50]	[0.50]	[0.90]	0.78	2.18	2.38	[22.84]
Manistee	3.05	2.53	0.06	2.04	3.62	4.96	2.42	1.30	3.06	0.45	2.89	3.29	29.67
Marquette	3.94	2.45	1.02	2.63	1.16	3.15	4.80	1.68	3.71	0.78	2.04	2.95	30.31
Marshall	1.93	1.84	1.88	1.90	6.68	4.39	2.35	0.61	0.67	1.44	2.78	2.31	28.78
May	1.94	2.20	0.64	0.95	4.74	4.81	3.55	[0.30]	1.07	1.54	[3.00]	3.06	[27.80]
Mio	2.12	0.57	0.04	[0.90]	3.32	3.13	1.33	1.82	[2.80]	1.00	2.95	3.89	[23.87]
Montague	2.14	2.88	0.29	1.05	5.23	3.48	2.09	0.69	2.00	0.45	2.04	3.60	25.94
Mottville	1.05	0.68	1.96	1.02	3.53	5.73	3.17	0.95	0.91	1.51	3.26	2.04	25.81
Noble	1.47	1.79	1.38	0.95	4.75	4.74	4.89	0.85	2.60	1.25	[2.40]	2.33	[29.40]
North Adams	......	......	......	2.01	4.40	......	2.19	0.44	1.22	0.93	3.48	......	......
North Aurelius	2.63	1.19	1.35	1.85	4.58	5.13	3.44	[0.40]	[0.70]	0.20	3.02	2.97	[27.46]
North Marshall	1.46	1.06	1.88	2.55	4.83	4.06	2.43	0.23	[1.10]	1.13	3.31	2.16	[26.20]
Olivet	1.44	1.25	0.72	1.61	4.45	6.27	1.83	0.28	1.01	1.06	3.13	2.56	25.61
Ovid	1.77	1.08	0.87	1.44	3.19	5.35	2.56	0.07	0.76	0.73	2.37	2.71	22.90
Paw Paw	1.53	2.04	1.43	1.24	4.68	6.73	4.89	0.90	3.27	1.60	4.27	2.55	35.13
Petersburgh	2.71	1.80	2.20	1.54	6.75	4.82	2.31	......	......	......	......	......	......
Pontiac	1.79	0.62	1.42	1.75	4.36	2.39	1.57	0.53	0.76	1.21	3.64	2.58	22.62
Port Huron	3.08	1.71	0.73	1.88	3.66	1.86	0.69	0.14	0.46	1.56	3.73	2.72	22.22
Pulaski	1.09	0.97	1.82	0.77	4.81	4.15	2.86	0.41	1.23	0.99	3.42	1.75	24.27
Rawsonville	[2.20]	[1.50]	[1.60]	0.60	4.40	2.26	1.70	0.08	1.13	0.80	2.65	3.00	[21.92]
Romeo	......	......	......	0.66	4.43	......	......	......	1.00	0.61	2.82	3.13	......
Roscommon	2.46	2.00	0.15	1.66	3.02	3.73	1.43	0.58	4.12	0.74	2.28	3.87	26.04
St. Ignace	[2.30]	[2.10]	0.05	0.96	2.98	7.36	3.23	4.04	4.50	1.43	[1.80]	3.57	[34.27]
St. John's	1.88	1.53	0.85	1.97	3.08	3.94	2.66	0.59	0.97	0.64	3.65	3.12	24.88
Sand Beach	[1.80]	0.69	0.30	0.85	3.23	5.59	1.81	1.55	0.79	0.97	[2.30]	3.25	[23.13]
Sault de Ste. Marie	2.50	2.67	0.31	2.37	2.54	5.83	3.36	3.07	5.60	1.86	1.84	3.44	35.39
Standish	[1.60]	[2.00]	[0.20]	0.10	7.32	6.62	1.78	1.72	1.88	0.42	3.51	4.60	[31.75]
Stanton	[3.20]	1.57	0.39	1.45	3.23	5.38	4.20	0.51	1.71	0.75	2.67	2.87	[27.93]
Stockbridge	1.61	1.15	1.84	1.21	3.97	[3.20]	1.75	0.25	[0.70]	0.63	2.37	2.67	[21.35]
Thornville	2.51	1.17	0.71	1.34	4.48	2.38	1.90	0.35	1.56	1.28	3.79	3.09	24.56
Traverse City (1)	2.64	[4.38]	0.06	2.67	5.45	5.99	3.35	2.55	4.81	0.71	4.01	4.04	[40.66]
Traverse City (2)	2.67	4.38	1.35	2.97	3.82	4.15	2.63	1.26	4.81	0.60	3.23	4.04	35.91

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Michigan—Continued.													
Vandalia	1.30	1.51	1.66	1.15	5.40	4.42	4.17	0.54	1.49	1.27	3.67	2.19	28.77
Vienna	2.95	1.43	0.39	1.96	3.64	6.23	1.69	2.19	4.20	1.12	3.17	4.22	33.19
Washington	2.12	1.33	1.29	1.61	4.48	1.83	2.58	0.64	1.04	0.83	2.63	2.77	23.15
Weldon Creek	2.88	4.07	0.25	1.88	2.18	3.23	1.72	1.14	2.09	0.22	2.33	3.59	25.58
West Branch	4.00	[1.90]	0.25	[0.90]	2.15	5.30	2.44	1.41	2.28	0.93	3.40	4.72	[29.68]
Williamston	2.15	1.47	0.92	2.72	3.74	4.32	3.15	0.58	0.70	1.30	3.73	2.55	27.33
Ypsilanti (1)	1.83	1.05	1.61	1.38	5.17	4.11	2.68	0.31	0.69	0.55	2.49	3.14	25.01
Ypsilanti (2)	2.23	1.18	1.66	1.49	5.38	5.50	2.43	0.63	1.79	0.88	2.90	3.39	29.46
Minnesota:													
Alexandria	0.93	0.56	1.26	1.97	1.79	1.64	2.66	2.04	2.36	0.14	0.43	1.20	16.98
Brainerd	[1.20]	[1.00]	0.35	2.06	2.34	2.05	3.57	4.15	1.85	0.28	[0.60]	[1.00]	[20.45]
Duluth	1.34	1.38	1.67	3.35	2.05	1.85	5.53	7.87	4.02	0.34	0.87	1.77	32.04
Farmington	0.92	0.95	0.91	2.10	2.31	3.43	1.80	6.09	0.82	0.01	0.72	3.01	23.07
Fergus Falls	1.12	0.40	T.	0.88	3.55	1.36	3.78	1.91	1.73	0.00	0.20	0.94	15.87
Fort Ripley	0.52	0.90	1.00	1.90	1.92	2.66	1.69	2.32	0.52	0.16	0.32	0.95	14.86
Fort Snelling	0.63	0.58	0.67	1.06	2.09	1.75	2.15	3.69	0.82	0.00	0.44	0.93	14.81
Grand Meadow	0.53	0.26	T.	1.12	2.78	3.30	2.64	1.57	2.80	0.17	0.92	1.68	17.77
Lake Winnibigoshish Dam	1.32	1.18	0.82	1.83	0.85	2.14	3.59	4.18	2.85	0.25	1.03	1.26	21.30
Leech Lake Dam	0.97	1.09	0.93	[1.80]	[1.20]	1.63	4.58	3.81	2.89	0.34	0.92	1.12	[21.28]
Le Sueur	[0.90]	0.48	1.03	1.14	1.48	2.95	2.33	2.24	0.54	0.12	1.28	2.06	[16.55]
Mankato	1.03	0.51	0.63	1.23	2.47	2.31	4.02	2.23	0.74	0.02	1.40	2.57	19.16
Medford	0.83	0.50	0.55	1.71	1.09	2.13	3.68	2.83	......	......	......	......	......
Minneapolis	1.04	1.36	1.07	1.53	3.06	1.53	3.16	2.39	0.82	0.06	1.08	1.26	18.36
Montevideo	......	......	......	......	......	......	......	0.24	2.07	0.00	0.13	1.76	......
Moorhead	1.13	0.85	0.24	1.48	1.71	0.96	1.95	1.40	6.27	0.07	0.18	0.83	17.07
Morris	0.93	0.32	0.48	1.58	1.86	4.53	3.69	2.07	1.98	T.	0.09	0.77	18.30
Northfield	0.92	1.15	0.57	1.72	2.66	3.28	1.83	4.62	0.68	0.04	0.94	2.22	20.63
Ortonville	0.20	1.00	0.20	0.87	3.09	3.43	3.70	0.46	2.43	0.00	0.21	2.16	17.75
Pine River Dam	0.92	0.66	1.34	2.30	1.78	0.91	2.63	6.72	2.14	T.	0.53	0.93	20.86
Pokegama Falls	1.34	1.61	1.34	1.82	1.18	2.08	4.32	6.21	2.71	0.31	1.30	1.43	25.65
Red Wing	0.80	0.54	0.51	1.35	1.85	3.01	2.23	3.96	1.45	0.02	1.32	1.94	18.98
Redwood Falls	0.83	0.11	0.09	0.74	2.30	2.88	4.97	0.46	1.96	0.07	0.45	1.26	16.12
Rolling Green	0.92	0.85	0.55	1.55	1.10	3.85	1.65	0.59	0.87	T.	2.40	1.48	15.81

St. Paul	*0.55*	*0.31*	*0.99*	*1.14*	*2.86*	*1.61*	*3.08*	*3.56*	*0.51*	*0.06*	*0.97*	*1.32*	*16.96*
St. Vincent	*0.82*	*1.03*	*0.35*	*0.69*	*0.81*	*0.76*	*1.23*	*2.20*	*2.77*	*0.18*	*1.20*	*2.40*	*14.44*
Tracy	*0.56*	*0.07*	*0.35*	*0.18*	1.05	2.21	1.55	0.21	2.06	0.04	0.37	1.49	10.14
Mississippi:													
Aberdeen					3.38	6.75	7.89	2.52	2.35	0.20	2.96		
Agricultural College	6.17	2.47	4.63	4.18	1.55	[6.80]	7.72	4.03	1.24	0.70	4.18	0.77	[44.44]
Batesville	4.11	3.60	2.90	1.45	1.00	9.55	8.27	2.46	3.07	0.00	4.86	0.30	41.57
Booneville				1.25	0.78	8.65	5.35					0.98	
Brookhaven					0.23	7.25	6.53	1.59	1.85	0.02	3.40	1.50	
Canton	4.21	0.69	4.96	5.11	0.70	7.04	3.03	3.12	0.81	0.28	[4.30]	1.10	[35.35]
Columbus					0.90	7.64	4.35	0.40	0.00	0.58	4.53	0.60	
Corinth					0.75	9.95	8.73	2.59	4.86	0.38	5.50	0.81	
Edwards	[4.60]	0.53	4.59	[3.50]	1.74	7.69	5.90	1.41	1.11	0.45	3.10	1.65	[36.27]
Fayette						7.39	4.68	1.31	0.32	0.17	3.45	1.04	
Greenville	[5.30]	2.71	1.89	2.60	4.03	7.09	4.50	1.86	4.05	0.40	5.92	1.05	[41.40]
Hazlehurst					0.12	3.38	1.16	0.31	0.19	0.00	1.30		
Hernando					2.03	9.89	2.07	1.75	2.30	0.02	1.90		
Holly Springs (1)					1.24	7.57	3.50	2.30	6.60	0.60	4.80	1.00	
Holly Springs (2)					1.50	7.74	3.64	3.04	5.76	0.46	5.35	0.40	
Jackson					2.30	6.63	3.14	0.42	0.27	0.27	2.78	0.42	
Kosciusko	5.99	1.50	0.70	2.17	0.45	5.33	4.00	1.14	0.00	0.06	0.30	0.85	22.49
Lake					2.20	3.98	7.39	1.87	0.90	0.02	1.73	1.25	
Loch Leven	5.14	0.68	3.68	2.63	0.79	8.52	2.75	2.63	5.40	0.61	3.82	[1.20]	[37.85]
Logtown	6.20	3.47	6.09	2.13	1.12	3.64	6.82	8.75	4.01	0.06	3.80	1.82	47.91
Louisville	4.75	1.99	4.61	3.52	0.54	6.10	9.27	2.27	0.95	0.17	3.76	1.01	38.94
Macon (1)					1.02	1.72	3.06	3.35	0.37	0.08	0.70		
Macon (2)	5.80		5.05	5.32	0.84	7.60	7.00				0.70		
Meridian					0.54	2.35	4.91	2.77	3.92	0.65	4.12	2.09	
Natchez					0.78	6.76	7.94	4.11	0.43	0.18	4.02		
Okolona					0.90	5.43	4.10	1.22	0.60	0.10	2.30	0.40	
Palo Alto	5.38	2.58									4.65	1.27	
Pearlington	5.84	3.47	6.05	2.13	1.36	3.11	6.14	8.74	4.01	0.06	3.80	1.82	46.53
Pontotoc	7.82	3.00	3.03	2.23	1.77	8.65	6.23	3.51	1.39	0.19	2.77	0.67	41.26
Port Gibson					1.15	4.29	4.63	1.25	0.16	0.11	2.12	0.90	
Rienzi	[5.30]	4.14	2.08	1.74	1.25	7.60	7.43	1.43	3.09	0.48	6.34	1.02	[41.90]
Ripley						9.05			3.06	0.65	5.39		
Summit	5.13	3.12	4.24	3.52	0.55	5.40	9.96	3.33	0.00	0.04	2.81	[1.20]	[39.30]
University	5.21	3.55	3.04	1.83	1.94	8.39	4.75	4.56	3.17	0.59	5.36	0.48	42.87
Vicksburg	4.66	0.44	7.02	3.53	1.17	9.83	5.64	2.13	1.14	0.16	4.59	0.99	41.30
Water Valley	4.64	3.73	2.30	3.51	2.29	8.47	3.72	3.24	1.54	0.39	4.64	0.96	39.43
Waynesborough (1)					0.15	3.31	5.05	1.59	4.06	0.00	2.79	0.99	

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Mississippi—Continued.													
Waynesborough (2)	4.59	1.89	3.36	3.18	0.45	5.73	5.11	1.81	5.08	0.00	4.94	0.99	37.13
Yazoo City	4.51	1.30	3.49	3.58	1.35	5.32	5.85	3.53	1.53	0.00	5.24	1.24	36.94
Missouri:													
Boonville	......	......	......	......	8.25	......	4.56	1.32	6.58	1.63	3.18	......	......
Carthage	3.44	4.54	4.57	4.01	4.95	4.29	1.46	2.37	2.68	3.00	2.61	0.36	38.28
Conception	1.06	0.37	0.90	3.57	4.12	2.42	2.71	2.30	4.16	0.85	1.63	0.00	24.09
Craig	3.10	2.50	0.50	......	......	......	......	......	......	......	2.20	0.00	......
Excelsior Springs	1.76	2.26	0.75	2.18	8.93	3.80	5.48	3.94	5.58	2.81	2.33	0.08	39.84
Fayette	1 87	2.05	1.09	1.90	9.20	6.07	4.81	0.67	7.34	3.36	3.24	0.98	42.58
Fox Creek	3.35	3.66	1.65	1.38	3.70	3.15	2.58	0.64	4.95	1.75	3.27	2.09	32.17
Frankford	2.03	3.15	1.45	2.37	7.00	3.80	3.69	1.94	6.37	5.61	4.73	1.02	43.16
Glasgow	1.89	2.06	0.90	0.67	7.83	6.17	4.60	0.62	9.28	3.97	2.66	1.42	42.07
Grand Pass	1.61	1.58	1.59	2.02	8.93	6.50	3.74	1.33	6.66	3.05	2.80	0.40	40.21
Harrisonville	1.81	2.18	2.42	3.83	8.23	3.69	6.29	2.48	7.36	0.73	2.92	0.55	42.49
Hermann	2 97	2.71	2.43	1.57	7.43	4.86	2.22	0.98	5.89	1.59	6.25	0.79	39.69
Ironton	3.40	3.65	3.10	1.70	3.95	7.00	6.65	0.10	2.50	2.05	5.50	4.05	43.65
Jefferson Barracks	2.52	4.00	0.30	2.80	3.00	4.00	1.28	1.42	2.91	2.60	3.75	1.42	30.00
Jerome	[2.80]	[1.90]	[2.00]	2.00	2.12	1.78	3.93	0.08	0.28	[2.50]	3.22	0.01	[22.62]
Kansas City (1)	1.05	1.91	1.61	2.80	8.98	3.11	3.06	4.64	7.08	1.57	2.38	0.14	38.33
Kansas City (2)	1.35	2.43	2.18	3.83	9.03	3.29	3.42	4.41	7.73	1.47	2.87	0.25	42.26
Kidder	......	1.20	......	5.40	10.30	......	......	......	......	3.10	......	T.	......
Kirksville	1.02	1.42	2.24	2.22	5.70	2.48	1.81	0.30	4.80	[2.40]	[2.50]	0.25	[27.14]
Lamonte	2.29	3.00	3.18	3.15	[4.40]	4.76	1.79	1.63	4.26	1.76	1.80	1.20	[33.22]
Langdon	1.10	0.54	0.30	1.30	4.15	2.82	2.36	5.25	0.93	1.18	0.25	0.00	20.18
Louisiana	[2.00]	[2.90]	[1.30]	3.44	6.30	2.84	2.23	1.05	4.23	2.52	2.74	1.33	[32.88]
Mexico	2.03	1.99	1.19	1.71	7 94	4.49	2.18	0.69	7.41	4.01	2.98	0.90	37.52
Miami (1)	1.60	1.97	1.08	2.56	9.72	5.85	5.60	1.02	6.02	2.50	3.75	0.51	42.18
Miami (2)	1.73	2.46	0.97	2.29	10.24	6.66	6.22	1.42	5.92	3.86	5.10	0.51	47.38
New Frankfort	[1.70]	3.15	3.78	[1.80]	14.35	8.80	2.15	0.93	2.87	3.15	3.25	1.50	[47.43]
New Haven	3.00	3.50	1.25	2.00	7.25	6.00	2.50	2.62	6.62	2.88	3.88	0.50	42.00
Oak Ridge	2.50	2.50	[1.80]	1.60	2.75	8 80	2.50	2.80	3.35	3.25	4.30	4.60	[40.75]
Oregon	1.53	1.45	0.50	1.99	6.26	3.81	4.52	4.63	2.13	1.35	1.65	0.10	29.92
Ozark	3.20	3.00	3.60	2.60	4.31	2.92	1.13	2.40	4.70	1.60	3.82	1.20	34.48
Princeton	1.30	0.80	0.32	3.96	6.19	6.65	4.28	0.55	3.40	1.05	3.35	0.40	32.25

St. Charles (1)	*2.80*	*3.10*	*1.40*	*0.90*	*4.03*	*3.70*	*4.80*	*1.30*	*4.00*	*1.30*	*3.90*	*0.70*	*31.93*
St. Charles (2)	*2.63*	*2.78*	*1.48*	....	*3.70*	....	....	*1.41*	*4.37*	*2.19*	....	....	....
St. Joseph	[1.60]	[1.30]	[0.60]	5.65	6.20	4.20	4.77	2.19	3.19	1.20	2.60	0.19	[33.69]
St. Louis (1)	3.04	4.78	1.62	1.68	3.80	4.72	2.02	0.85	3.54	1.65	4.43	1.03	33.16
St. Louis (2)	....	4.93	1.67	2.03	3.95	....	....	....	....	....	....	....	....
St. Louis (3)	4.05	5.97	2.34	2.28	5.38	4.88	2.36	1.21	5.55	4.03	6.19	1.30	45.54
St. Louis (4)	2.30	2.40	2.25	1.00	....	3.25	....	....	....	....	....	....	....
Savannah	1.00	0.80	0.25	2.70	7.05	3.85	6.30	2.55	....	....	....	....	....
Sedalia	1.98	2.21	2.78	2.87	8.82	4.25	1.02	1.24	6.27	2.99	1.99	1.32	37.74
Shelbina	1.62	1.63	1.50	2.50	10.70	3.40	3.40	1.00	4.60	5.60	2.50	1.50	39.95
Springfield (1)	2.45	4.38	5.92	4.41	4.84	5.80	6.53	2.70	2.01	2.25	5.62	1.05	47.96
Springfield (2)	2.98	4.06	5.84	4.68	5.73	7.28	....	....	....	....	....	....	....
Steelville	3.82	4.60	2.29	1.03	4.85	3.45	3.25	1.68	2.44	2.75	2.84	1.08	34.08
Troy	2.37	2.50	3.25	....	....	....	....	....	5.68	6.00	....	....	....
Warrensburgh	1.80	2.35	2.77	2.75	8.86	5.71	4.25	2.07	4.44	2.53	1.36	1.36	40.25
Willow Springs	[3.20]	1.32	3.28	2.40	5.10	6.20	6.90	3.22	6.54	2.87	5.43	1.85	[48.31]
Wither's Mills	1.77	2.30	1.20	2.05	8.20	3.35	2.45	0.95	6.00	6.03	3.10	1.03	38.43
Montana:													
Custer Station	0.04	0.25	0.09	0.19	0.41	0.06	0.13	0.05	0.06	0.06	0.40	0.04	1.78
Fort Assiniboine (1)	0.26	0.45	0.81	0.31	3.15	0.24	3.22	0.10	0.57	T.	0.26	0.38	9.75
Fort Assiniboine (2)	0.26	0.45	0.75	0.30	3.23	0.27	3.14	0.00	0.65	0.00	0.20	0.15	9.40
Fort Custer	0.20	0.56	0.25	0.95	1.59	0.90	0.76	0.89	0.51	0.50	0.12	0.25	7.48
Fort Keogh	0.46	1.68	1.01	0.20	2.62	0.18	0.37	1.26	1.06	0.67	0.35	0.08	9.94
Fort Logan	....	....	....	....	2.03	0.82	0.62	0.31	0.81	0.37	0.15	0.37	....
Fort Maginnis	1.13	1.46	1.89	1.11	2.84	0.61	0.87	1.18	1.43	0.05	0.92	0.51	14.00
Fort Missoula	0.03	1.14	1.02	0.96	1.48	1.00	0.00	0.00	0.33	1.27	1.21	0.71	9.15
Fort Shaw	0.38	0.70	0.34	0.20	1.50	0.60	0.56	0.00	0.35	0.00	0.10	0.22	4.95
Galpin	0.13	0.37	0.32	0.26	2.57	0.72	0.41	0.19	0.90	0.16	0.16	0.53	6.72
Glendive	[0.30]	[1.00]	[0.30]	[0.30]	1.65	0.75	1.39	1.40	2.95	0.03	0.06	0.03	[10.16]
Helena	0.42	0.72	0.64	0.11	2.20	0.40	0.34	0.31	0.48	0.14	0.77	0.18	6.71
Kintyre	....	....	....	....	....	....	0.95	0.02	1.25	0.12	0.03	0.14	....
Poplar River, camp	1.58	0.15	0.43	0.07	2.82	0.28	0.50	0.08	1.19	0.02	5.43	0.77	13.32
Powder River	....	....	....	....	....	....	....	0.02	0.90	0.37	0.14	0.07	....
Sheldon	3.15	1.03	1.48	0.34	3.10	0.30	0.20	[0.25]	1.00	0.90	3.30	3.85	[18.90]
Virginia City	0.06	0.11	0.92	0.63	1.98	0.23	0.06	1.23	0.29	0.48	0.40	0.69	7.08
Nebraska:													
Alliance	....	....	....	....	....	....	....	1.78	1.56	1.15	....	0.80	....
Ansley	0.30	T.	2.20	0.50	1.30	2.93	8.90	1.23	0.40	0.60	0.80	T.	19.16
Ashland	1.34	0.14	0.63	1.29	2.93	5.63	8.94	8.46	2.08	0.15	1.71	0.10	33.40
Bingham	....	....	....	....	....	3.71	1.29	2.95	1.75	....	0.17	0.17	....
Craig	[1.00]	[0.20]	[0.60]	0.57	2.80	8.75	6.09	2.43	1.61	0.20	2.16	0.27	[26.68]

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Nebraska—Continued.													
Creighton	1.75	0.15	0.22	2.62	2.12	3.53	7.88	0.35	3.70	0.19	0.71	0.33	23.55
Crete (1)	1.45	0.25	1.42	2.70	4.46	2.78	6.05	5.86	1.97	0.37	1.75	T.	29.06
Crete (2)	1.45	0.31	1.40	2.70	4.46	2.50	6.05	5.86	1.91	0.37	1.65	T.	28.66
Culbertson (1)	0.75	0.13	1.04	2.43	2.28	2.49	6.18	2.97	0.85	1.30	0.55	0.11	21.08
Culbertson (2)	0.50	0.51	1.19	1.62	2.28	2.14	6.62	2.90	0.83	1.30	0.59	0.11	20.59
David City	0.65	0.20	3.10	2.48	2.43	2.65	4.98	1.70	1.60	1.50	1.30	0.75	23.34
De Soto	1.18	0.23	0.53	1.22	2.94	6.37	3.49	1.42	0.85	0.74	1.38	0.07	20.42
Fairbury	1.51	0.36	1.75	1.81	7.79	0.61	8.75	1.01	2.46	1.07	0.66	0.00	27.78
Falls City	1.51	1.06	0.55	2.95	6.55	3.92	5.37	5.01	1.12	2.14	0.75	0.00	30.93
Fort Niobrara	0.30	0.18	0.64	3.44	2.92	2.92	3.27	0.41	1.39	1.37	0.60	0.72	18.16
Fort Robinson	0.08	0.32	T.	1.39	2.55	2.71	2.67	2.15	0.38	0.74	0.13	0.78	13.90
Fort Sidney	0.24	0.78	0.80	3.14	1.20	1.40	3.75	1.20	0.00	1.00	0.00	1.15	14.66
Franklin	1.60	0.20	2.15	2.09	5.28	3.62	......	......	......	......	......	0.03	......
Fremont	0.56	0.35	0.93	1.73	2.41	5.18	6.72	2.02	1.40	0.45	0.28	0.11	22.14
Genoa	1.12	0.10	0.99	2.21	2.02	3.22	5.96	1.24	1.76	0.58	1.30	0.44	20.94
Gering	......	......	......	......	......	......	2.14	1.27	0.21	1.80	0.26	0.45	......
Grand Island	......	......	......	......	......	......	......	......	0.87	0.46	0.75	0.20	......
Hay Springs	0.46	0.94	0.82	2.27	3.66	3.41	1.86	3.55	0.64	0.60	0.28	0.67	19.16
Howe	......	......	......	......	......	......	......	......	1.08	0.68	1.51	T.	......
Kennedy	[0.70]	0.62	2.00	5.94	3.38	3.06	2.02	1.28	1.28	1.70	1.10	0.51	[23.59]
Kimball	......	......	......	......	......	1.16	1.62	1.97	0.00	0.84	T.	......	......
Lincoln	1.28	0.23	1.01	2.28	[4.40]	2.93	5.16	4.40	2.41	0.38	1.03	0.00	[25.51]
Lexington	......	......	......	2.33	......	......	......	......	......	0.37	0.35	0.52	......
Marquette	0.84	0.12	1.12	2.14	2.12	3.65	9.59	3.53	3.72	[1.50]	2.66	0.40	[31.39]
Minden	1.37	0.15	2.83	2.81	5.24	5.71	13.20	2.40	3.40	1.85	1.50	0.55	41.01
Nebraska City	1.30	0.29	0.68	1.80	4.26	4.11	4.38	3.43	1.22	0.95	0.74	0.04	23.20
North Loup	0.93	0.11	0.65	1.83	0.98	3.84	10.37	1.58	1.60	0.45	0.69	0.35	23.43
North Platte	0.97	0.07	0.62	2.65	2.71	1.95	6.01	2.06	2.57	0.31	0.20	0.54	20.66
Oakdale	0.88	0.13	0.20	1.68	1.57	4.90	4.03	0.39	1.47	0.29	0.78	0.60	16.92
Omaha	1.62	0.23	0.53	1.19	2.67	5.44	4.94	2.90	1.74	0.34	0.87	0.50	22.97
Omaha Barracks	0.37	0.04	0.41	0.49	2.58	5.18	4.17	2.74	1.79	0.83	1.40	T.	20.00
Palmer	1.70	0.10	0.75	2.50	1.00	3.65	9.75	2.30	2.00	0.50	1.60	0.20	26.05
Plattsmouth	[1.30]	[0.30]	[0.70]	1.90	2.90	4.90	8.75	4.20	2.90	0.69	1.02	0.30	[29.86]

Ravenna	1.02	0.03	1.45	2.03	1.43	4.02	8.76	1.79	1.35	1.04	0.95	0.25	24.12
Red Willow	1.00	T.	1.54	2.28	2.00	4.52	....	....	....	....	....	....	....
Sargent	1.00	0.17	0.78	1.50	1.03	4.18	4.76	1.28	1.02	0.39	0.72	[0.25]	[17.08]
Stratton	....	....	1.38	2.80	1.20	3.25	1.95	....	....	....	....	....	....
Syracuse	1.15	0.47	0.80	2.13	3.39	3.34	5.53	3.84	1.03	1.41	0.42	0.03	23.54
Tecumseh	1.90	0.90	1.35	2.27	5.42	3.85	5.40	12.10	1.50	1.85	0.60	0.00	37.14
Valentine	1.27	0.15	1.05	3.87	2.05	2.99	2.60	0.34	1.71	2.12	0.56	0.84	19.55
Weeping Water	1.72	0.24	0.74	1.25	5.22	3.58	4.60	8.11	2.49	T.	2.62	0.25	30.82
Weston	[1.30]	[0.25]	[0.70]	1.78	3.00	5.36	8.80	11.58	1.84	0.62	0.42	0.00	[35.65]
West Hill	0.75	0.07	0.70	2.10	1.67	1.49	5.32	1.31	0.84	0.46	1.50	0.82	17.03
West Point	0.90	0.10	0.10	1.70	1.90	9.55	3.62	3.00	[1.00]	0.02	2.20	0.75	[24.84]
Nevada:													
Austin	0.60	....	....	....	0.25	....	0.00	0.00	....	....	0.54	2.66	....
Battle Mountain	0.60	0.00	1.16	0.45	0.64	0.23	0.00	0.00	0.00	1.55	0.00	1.04	5.67
Belmont	....	....	....	....	0.70	0.90	T.	1.33	0.01	1.06	0.94	4.06	....
Beowawe	0.90	0.00	0.18	0.20	0.11	0.05	0.00	T.	0.00	1.06	0.05	1.88	4.43
Browns	0.71	0.00	0.30	0.00	0.00	0.04	0.00	0.00	0.00	0.42	0.15	1.38	3.00
Burner's Ranch	0.33	0.70	3.44	4.10	6.53	[0.60]	1.12	2.23	T.	2.46	[0.40]	[4.00]	[25.91]
Candelaria	[0.30]	[0.20]	[0.50]	0.90	0.16	0.21	T.	0.17	T.	1.82	0.13	1.37	[5.76]
Carlin	0.90	0.00	1.35	0.23	1.05	1.15	0.00	0.50	0.10	1.62	0.40	3.45	10.75
Carson City (1)	1.06	0.13	1.73	0.03	1.72	0.27	0.00	0.00	0.00	1.04	2.11	4.76	11.85
Carson City (2)	0.10	0.27	1.63	0.03	1.91	0.33	0.00	0.00	0.00	1.08	2.47	4.62	12.44
Crane's Ranch	0.62	1.54	1.54	0.80	1.40	1.08	0.00	0.00	0.11	1.71	0.30	3.18	12.28
Dayton	0.20	0.17	0.88	0.99	1.02	....	....	....	....	....	....	....	....
Downeyville	....	....	....	....	0.06	T.	T.	0.00	0.00	1.73	0.20	2.20	....
El Dorado Canyon	0.80	T	0.54	0.03	0.02	T.	2.32	0.04	0.48	0.80	0.24	5.77	11.04
Elko (1)	0.70	T.	0.92	0.05	2.08	0.70	0.00	0.00	0.00	2.90	0.81	3.96	12.12
Elko (2)	0.55	0.02	2.05	0.10	1.46	0.50	0.00	0.20	0.03	2.52	0.51	2.42	10.36
Ely	1.01	0.64	0.94	0.57	1.39	0.23	0.00	2.11	0.50	0.95	0.50	4.70	13.54
Eureka	0.86	0.03	1.46	0.23	1.58	0.53	0.01	0.54	T.	1.47	0.19	2.39	9.29
Fenelon	0.62	0.15	0.68	0.30	2.35	0.10	0.00	0.30	0.05	1.39	0.30	3.75	9.99
Ferguson's Ranch	[0.40]	[0.15]	[0.50]	0.03	0.16	0.06	0.00	0.00	0.00	0.33	0.25	1.00	[2.88]
Fort McDermitt	0.15	....	1.04	0.78	1.27	....	....	....	....	....	....	....	....
Genoa	0.76	0.00	4.45	[0.03]	1.25	0.07	0.00	0.00	0.00	2.92	5.45	7.85	[22.78]
Golconda	0.55	0.00	0.40	0.05	0.35	0.00	0.00	0.00	0.00	0.33	0.05	1.57	3.30
Halleck	0.90	0.30	0.75	0.27	1.80	0.53	0.00	0.00	0.00	1.40	0.47	2.10	8.52
Hawthorne (1)	....	....	....	....	0.20	0.10	0.10	1.60	0.70	4.50	2.80	....	....
Hawthorne (2)	0.10	0.67	0.00	0.15	T.	0.00	0.00	0 00	0.82	0.60	0.00	1.03	3.37
Hot Springs (1)	....	....	0.00	....	0.00	0.00	0.00	0.00	....	0.25	T	0.70	....
Hot Springs (2)	[0.10]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	T.	0.00	0.70	[0.80]
Humboldt (1)	T.	0.00	0.50	0.20	0.90	0.25	0.00	0.00	0.00	0.57	0.10	1.57	4.09

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Nevada—Continued.													
Humboldt (2)	0.10	0.00	0.50	0.22	0.90	0.25	0.00	0.00	0.00	0.57	0.10	1.57	4.21
Lewer's Ranch	0.40	0.46	2.80	0.13	3.15	0.32	T.	0.00	0.00	2.36	5.04	8.44	23.10
Mill City	0.00	0.00	0.49	0.60	1.38	[0.10]	0.00	0.00	0.00	0.60	0.08	4.53	[7.78]
Montello	0.50	0.00	0.57	0.65	0.98	0.89	....	....	....	....	....	....	....
Palisade (1)	0.40	0.00	0.70	0.37	1.20	0.23	0.00	0.00	0.50	2.41	3.36	2.49	11.66
Palisade (2)	0.80	0.00	0.70	0.37	1.20	0.23	0.00	0.00	0.05	2.41	0.36	2.50	8.62
Pioche	1.10	0.79	2.07	1.30	2.11	0.09	0.79	3.27	2.00	1.61	1.10	11.12	27.35
Punch Bowl	....	....	....	....	0.38	0.08	0.00	0.65	0.00	....	....	....	....
Reno (1)	0.30	0.25	0.95	0.00	[0.79]	0.00	0.00	0.00	0.00	0.75	1.10	2.91	[7.05]
Reno (2)	....	....	....	0.03	1.82	T.	0.00	....	....	0.36	1.74	2.31	....
Reno (State University)	0.37	0.29	[0.95]	0.14	0.79	0.11	0.44	[0.00]	[0.00]	T.	1.95	?0.33	[5.37]
Ruby Hill	....	....	....	0.10	T.	T.	T.	1.55	0.00	....	T.	9.35	....
St. Clair	....	....	....	0.00	....	....	0.30	0.00	0.00	0.36	0.26	1.71	....
Sodaville	....	....	....	....	....	0.01	0.00	0.02	0.00	1.77	....	2.45	....
Tecoma	0.45	0.00	0.60	1.00	0.70	0.50	0.00	0.00	0.30	1.10	0.40	[4.00]	[9.05]
Toano	0.50	0.60	0.60	1.46	2.15	0.36	0.00	0.00	0.37	1.25	1.52	4.01	12.82
Tuscarora	2.54	0.24	1.41	0.16	2.38	0.30	T.	0.16	0.00	1.85	1.56	9.28	19.88
Verdi	0.05	0.40	2.98	0.14	3.30	0.01	0.00	0.00	0.00	1.53	3.43	6.03	17.87
Virginia City	....	....	....	0.34	1.49	0.06	0.00	....	0.00	0.97	1.98	4.17	....
Wadsworth	....	....	....	....	0.29	0.24	0.00	0.00	0.00	0.29	0.55	1.16	....
Wellington	0.27	0.24	1.69	0.25	1.75	....	....	....	....	....	....	....	....
Wells	0.61	0.40	1.20	0.00	0.45	0.10	0.27	0.00	[0.05]	0.17	0.07	1.62	[4.94]
Winnemucca (1)	0.72	0.00	0.61	0.17	0.55	0.10	0.00	0.00	0.00	0.49	0.10	3.83	6.57
Winnemucca (2)	0.32	T.	0.47	0.14	0.60	0.11	T.	T.	0.00	0.61	0.10	3.40	5.75
New Hampshire:													
Antrim	5.20	1.91	2.72	2.27	2.73	3.89	6.80	3.10	3.04	5.35	4.82	4.02	45.85
Belmont	4.43	1.61	2.90	2.06	2.56	3.81	4.64	1.28	6.29	4.51	4.27	4.28	42.64
Berlin Mills	4.88	1.63	3.00	1.52	1.36	4.34	5.00	1.00	5.84	3.00	3.92	3.30	38.79
Bristol	5.89	1.95	2.29	2.24	2.68	3.70	4.55	1.99	4.42	4.37	5.03	4.91	44.02
Chesterfield	5.43	1.78	2.39	1.40	....	....	7.35	....	5.92	5.51	5.81	....	....
Concord	3.81	1.53	2.51	2.09	2.46	4.21	5.63	1.57	3.80	4.21	4.98	4.18	40.98
Hanover (1)	....	....	....	....	....	....	....	2.06	3.58	4.70	4.51	2.82	....
Hanover (2)	3.28	2.17	2.65	0.97	1.84	3.61	5.48	1.78	3.52	4.60	4.76	2.85	37.51

Lake Village	5.42	1.94	3.04	2.36	2.32	4.55	3.86	1.74	5.29	4.77	5.39	5.39	46.07
Manchester (1)	2.79	1.71	2.10	2.45	2.29	3.04	5.38	1.72	3.32	3.52	5.01	3.61	36.94
Manchester (2)	3.48	1.86	2.67	2.76	2.72	3.12	6.65	1.77	3.92	4.03	5.23	3.82	42.03
Manchester (3)	3.24	1.90	2.78	2.55	2.44	3.48	6.14	1.83	4.34	4.27	5.68	3.95	42.60
Mine Falls	3.45	1.72	2.35	2.59	3.21	1.91	7.01	2.31	3.11	5.15	7.09	3.20	43.10
Nashua	3.42	1.72	2.17	2.76	4.19	1.84	7.00	2.36	3.34	4.64	5.65	3.24	42.33
Newton	[3.20]	[1.70]	[2.50]	3.89	3.82	4.96	7.09	2.32	4.23	3.68	7.67	3.40	[48.46]
North Conway	5.10	2.71	1.42	2.45	2.06	3.74	6.02	3.02	3.43	4.97	5.42	5.46	45.80
North Sutton	[4.40]	2.20	2.13	2.29	3.06	2.20	4.85	1.88	3.71	3.94	4.61	4.84	[40.11]
Pennichuck Station	3.26	1.27	2.22	2.98	4.09	2.07	5.63	2.20	2.92	4.33	5.67	3.05	39.69
Plymouth	4.29	2.86	2.24	1.60	2.21	4.61	4.67	3.17	4.63	4.14	4.66	5.09	44.17
Shaker Village	4.07	2.20	2.19	2.03	2.63	3.57	5.44	1.38	3.49	4.09	1.75	4.32	37.16
Stratford	1.77	0.77	2.48	0.98	2.24	5.03	4.00	1.81	6.52	2.96	3.66	3.92	36.14
Walpole	3.45	1.86	1.96	1.60	2.53	4.82	7.40	1.97	3.47	4.77	5.67	3.92	43.42
Weir's Bridge	4.24	2.06	2.69	1.91	2.42	4.21	3.23	1.71	5.11	3.87	4.71	4.71	40.87
West Milan	3.12	[1.50]	2.06	1.29	1.14	4.87	4.64	1.54	4.66	3.35	4.07	3.71	[35.95]
Wolfborough	5.76	2.13	3.06	2.33	1.95	3.22	5.11	1.13	3.86	3.81	6.57	2.98	41.91
New Jersey:													
Asbury Park	6.94	2.58	[3.20]	4.57	4.68	3.90	8.35	6.04	6.18	4.27	5.80	1.15	[57.66]
Atlantic City	4.46	2.32	4.58	2.92	2.62	3.13	4.66	1.93	3.17	3.02	5.77	0.25	38.83
Beverly	4.58	2.17	3.63	4.82	5.14	2.88	7.28	5.76	8.22	4.32	8.16	1.11	58.07
Bridgeton	4.03	2.70	6.49	4.96	6.60	4.48	7.66	3.29	3.97	3.91	7.99	0.67	56.75
Egg Harbor City	5.88	2.51	5.65	4.54	4.09	3.40	7.08	5.23	10.73	4.78	7.71	0.58	62.18
Freehold	8.30	2.23	5.34	6.31	4.99	2.92	9.89	7.98	10.63	3.45	7.26	1.45	70.75
Gillette	3.99	1.93	2.96	5.41	2.72	3.54	12.31	4.60	9.94	3.31	10.19	1.51	62.41
Hanover	6.54	2.16	2.45	7.02	2.79	3.53	11.83	4.23	9.24	3.15	10.72	2.14	65.80
Highland Park	6.42	2.41	3.35	5.01	3.48	3.85	10.59	4.88	7.49	3.57	7.97	1.91	60.93
Hopewell	3.84	1.65	2.55	5.40	4.40	5.05	9.06	5.26	10.90	5.03	7.40	1.95	62.49
Imlaystown	6.82	2.18	4.20	[6.00]	4.67	2.41	8.78	7.30	11.29	3.49	7.19	1.08	[65.41]
Lambertville	4.55	1.98	3.37	4.83	5.52	6.75	10.38	3.98	10.84	4.82	8.24	1.80	67.06
Locktown	4.60	2.04	3.40	5.99	5.35	5.92	13.06	5.77	7.97	4.63	9.66	1.67	70.06
Madison	6.98	2.37	2.74	6.46	3.00	3.56	12.47	4.10	9.70	3.07	10.20	[1.40]	[66.05]
Moorestown	4.07	2.27	3.85	3.84	4.59	3.44	7.94	5.50	6.10	4.03	7.02	1.01	53.66
Newark	6.04	2.86	3.31	6.24	2.43	3.04	14.60	4.57	8.23	2.42	8.87	2.38	64.99
New Brunswick (1)	6.86	2.35	3.00	4.83	3.34	3.64	10.35	5.16	8.63	3.32	8.37	1.95	61.80
New Brunswick (2)	6.43	2.38	3.23	4.97	4.19	3.38	10.45	5.01	7.83	3.13	8.49	1.81	61.30
Ocean City	6.50	3.80	4.80	5.60	5.30	4 60	5.40	4.00	6.80	4.30	4.70	[0.50]	[56.30]
Oceanic	8.78	2.95	5.70	5.75	4.09	5.99	8.90	9.06	8.76	4.28	8.79	2.09	75.14
Plainfield	8.37	2.84	3.75	7.25	4.11	3.78	15.52	5.85	13.13	4.11	11.13	2.47	82.31
Princeton	4.40	2.23	1.98	4.31	4.48	2.41	8.78	[5.30]	8.59	3.38	7.10	1.55	[54.51]
Rancocas	4.40	2.25	3.40	3.80	4.25	3.25	7.81	6.18	6.37	3.87	7.62	0.87	54.07

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
New Jersey—Continued.													
Somerville	5.54	3.17	2.84	5.14	....	....	....	....	....	....	....	....	....
South Orange	7.15	2.49	3.88	7.54	3.25	3.54	18.58	4.69	12.39	3.46	11.37	2.47	80.81
Tenafly	5.34	2.18	3.49	6.92	2.94	2.39	15.53	4.98	11.31	4.72	9.32	3.69	72.81
Tom's River	7.38	2.95	5.15	[4.90]	4.29	2.92	4.90	9.42	10.61	5.03	[8.40]	[1.30]	[67.25]
Trenton	4.40	3.36	5.67	5.00	4.47	2.67	9.86	7.23	10.13	4.66	7.75	2.03	67.23
Union	4.41	2.30	3.30	6.09	3.07	3.78	14.65	4.02	9.68	3.15	10.56	1.74	66.75
Valley	....	....	....	....	....	4.45	11.21	3.21	6.45	1.18	....	....	....
Woodbury	[4.40]	[2.70]	[3.50]	0.64	3.66	3.36	10.02	5.09	6.81	4.46	9.44	0.75	[54.83]
New Mexico:													
Albuquerque	[1.10]	[0.50]	[0.60]	0.70	T.	0.53	0.77	0.21	0.18	0.76	0.00	[0.20]	[5.55]
Antelope Springs	....	....	....	....	....	....	8.24	0.16	0.52	1.47	0.82	0.24	....
Cabezon	....	....	....	....	....	....	1.68	0.15	0.30	0.95	0.46	0.27	....
Cañon de Chama	....	....	....	....	....	....	0.47	2.16	1.67	0.70	1.45	0.98	....
Coolidge	0.60	0.80	0.60	0.40	0.40	1.20	3.20	0.00	0.90	0.20	0.30	0.20	8.80
Deming	1.09	0.10	0.12	0.05	0.00	0.90	1.09	0.64	3.55	0.84	0.80	0.00	9.18
El Rito	....	....	....	....	....	....	....	....	3.90	1.05	1.00	2.15	....
Embudo	1.13	0.37	0.32	1.04	[0.15]	0.55	3.27	1.33	1.19	1.16	0.33	0.35	[11.19]
Fort Bayard	0.50	0.41	0.18	T.	0.13	0.90	0.91	0.70	2.19	0.67	[0.80]	T.	[7.39]
Fort Marcy	[0.80]	[0.50]	[0.70]	0.64	0.23	0.61	1.61	1.48	0.72	0.32	0.23	0.14	[7.98]
Fort Selden	1.30	0.51	0.20	0.04	0.08	0.74	0.59	0.26	1.62	1.06	0.67	0.00	7.07
Fort Stanton (1)	1.33	0.39	0.86	0.24	0.17	2.51	2.36	0.89	2.76	1.90	1.04	0.04	14.49
Fort Stanton (2)	[1.33]	[0.39]	[0.86]	T.	0.17	2.55	1.75	0.81	2.65	1.55	0.89	0.40	[13.35]
Fort Union	1.20	T.	0.00	0.50	1.27	2.60	2.73	2.30	0.58	0.45	0.45	T.	12.08
Fort Wingate	1.15	1.60	....	....	....	0.30	2.54	0.75	....	0.41	0.47	1.10	....
Gallinas Spring	1.15	0.22	0.22	2.52	0.88	0.71	1.47	1.77	0.45	1.85	1.85	0.02	13.11
Good Hope	....	....	....	....	....	....	....	0.84	0.63	0.70	0.98	....	....
Hillsborough	....	....	....	....	....	1.23	4.19	0.76	3.93	0.78	1.20	....	....
Jaquez	....	....	....	....	....	....	1.19	0.61	1.05	0.65	1.50	....	....
Laguna	....	....	....	....	....	....	2.91	2.50	0.00	2.00	....	....	....
La Polvadera Tract	....	....	....	....	....	....	1.78	1.83	1.72	0.93	0.75	....	....
Las Vegas	1.19	0.22	0.50	2.15	0.35	1.25	4.30	1.15	0.80	1.30	4.20	1.01	18.42
Lordsburg	4.07	0.45	0.10	0.20	0.00	0.25	1.70	1.28	1.76	0.41	0.02	0.10	10.34
Lava	1.60	0.78	0.22	0.04	0.03	1.38	2.27	0.15	1.30	0.35	1.11	T.	9.23

Los Lunas	....	....	....	....	*T.*	*3.70*	*0.21*	*0.37*	*0.52*	*0.35*	*T.*	*T.*	....
Magdalena	....	....	....	....	....	*2.50*	*1.00*	*1.07*	*0.43*	*0.36*	*1.40*	*0.05*	....
Monero	....	....	....	....	....	0.65	2.61	0.92	....	1.55	0.30	2.60	....
Nogal	....	....	....	....	....	2.72	2.39	....	3.54	2.28	3.00	0.07	....
Ojo Caliente	....	....	....	....	....	....	2.15	1.95	0.92	1.20	....	....	....
Pojuaque	....	....	....	....	....	....	0.93	....	1.23	0.75	0.27	0.28	....
Red Cañon	....	....	....	....	....	0.72	1.26	0.65	1.57	1.60	0.50	0.00	....
Rio Hondo	....	....	....	....	....	....	3.80	0.90	1.85	1.00	....	....	....
San Marcial (1)	....	....	....	....	....	1.35	0.76	0.68	1.02	0.50	0.60	0.00	....
San Marcial (2)	....	....	....	....	....	....	1.13	0.99	2.55	0.66	0.70	0.00	....
San Pedro	....	....	....	....	....	....	1.22	0.60	0.35	0.90	2.00	....	....
Santa Fé	0.84	0.53	0.80	0.44	0.15	0.63	1.32	1.43	0.67	0.37	0.45	0.26	7.89
Springer	0.65	0.00	0.36	2.35	1.18	0.21	3.71	0.50	0.50	0.70	1.43	0.00	11.59
Taos	[0.90]	[0.10]	0.24	1.08	0.17	1.21	2.70	1.64	1.22	0.78	0.54	0.52	[11.10]
Tres Piedras	[0.90]	[0.30]	[0.30]	0.57	0.12	1.26	3.30	1.78	1.05	0.82	2.60	1.60	[14.60]
Wallace	....	....	....	....	....	....	....	0.25	0.80	0.70	1.00	0.25	....
New York:													
Albany	2.82	1.81	1.76	1.25	3.32	6.43	4.19	3.63	3.68	3.46	5.00	2.14	39.51
Alfred Centre	[3.10]	[1.50]	[1.40]	2.25	2.80	5.66	4.47	1.85	1.82	2.44	3.48	2.55	[33.32]
Angelica	3.10	1.26	1.67	3.81	5.12	7.43	5.00	2.60	2.34	3.33	4.27	3.29	43.22
Arcade	....	....	....	....	4.91	8.41	4.65	2.18	....	....	....	....	....
Ardonia	4.15	2.40	1.76	5.13	2.06	3.15	9.28	2.08	5.61	4.50	8.24	2.68	51.04
Auburn	4.31	[1.40]	[1.20]	[3.00]	3.60	7.49	7.96	2.96	4.10	3.38	6.07	3.07	[48.54]
Barnes Corners	4.35	1.57	1.03	3.08	....	....	....	....	....	....	....	....	....
Boyd's Corners	5.14	2.33	1.86	4.42	3.22	4.76	7.19	2.90	6.13	5.09	8.01	2.94	53.99
Buffalo	4.72	2.29	1.34	3.42	2.77	5.27	3.58	1.07	4.09	2.80	5.06	3.66	40.07
Canton	6.13	2.52	0.91	2.61	3.25	6.70	8.25	2.08	2.67	3.52	3.59	3.63	45.86
Carmel	5.28	2.08	2.89	3.91	3.04	4.06	9.52	3.69	6.03	4.19	8.74	[2.90]	[56.33]
Constableville	4.05	5.46	1.21	1.94	3.06	5.86	7.13	1.65	3.15	4.58	6.26	6.14	50.49
Cooperstown	2.22	1.79	1.76	2.93	3.96	5.95	5.61	2.13	3.87	2.17	3.50	2.68	38.57
Davids Island	6.12	2.35	1.26	5.48	3.05	2.32	13.12	4.34	4.78	4.82	9.79	3.22	60.65
Eden Centre	5.16	5.17	1.30	7.00	4.44	8.92	4.43	0.64	7.62	2.70	4.86	7.42	59.66
Elmira	2.08	0.75	*e*0.25	2.36	3.51	5.18	3.98	1.92	1.97	3.51	4.19	2.18	31.88
Factoryville	2.35	1.79	1.55	2.75	3.24	6.50	5.89	1.23	3.30	4.04	5.90	2.38	40.92
Fort Columbus	4.92	3.09	3.74	5.33	2.67	3.03	8.79	3.28	6.37	2.43	9.27	3.00	55.92
Fort Hamilton	5.00	2.06	3.36	5.34	3.31	3.60	7.54	5.62	4.36	2.12	8.30	1.55	52.16
Fort Niagara	2.88	0.69	0.73	2.13	3.84	3.94	2.08	1.40	2.14	2.89	3.85	2.25	28.82
Fort Porter	5.00	2.19	1.75	3.25	2.95	3.12	3.58	0.75	4.27	4.02	4.47	3.61	38.96
Fort Schuyler	2.44	1.66	2.70	4.03	2.86	4.25	10.09	4.00	8.21	2.88	9.84	2.05	55.01
Fort Wadsworth	6.23	2.63	3.74	5.55	3.59	3.67	8.28	5.67	7.08	3.01	9.11	1.85	60.41
Friendship	4.25	2.45	4.85	4.53	6.60	4.92	4.30	2.83	....	....	....	....	....

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
New York—Continued.													
Geneva	3.53	1.21	1.04	3.82	1.78	7.60	5.31	2.46	3.05	3.34	4.35	2.50	39.99
Hess Road Station	9.50?	4.62	3.57	6.04	7.26	12.13	6.98	1.81	6.68	8.32	15.23	5.99	88.13?
Houeymeadbrook	....	....	....	....	....	3.40	8.99	3.09	4.47	3.68	4.88	2.47	....
Humphrey	3.16	1.03	2.34	4.26	6.27	8.35	3.16	1.63	3.12	2.40	4.51	4.98	45.21
Ilion	3.69	2.80	2.30	2.15	2.59	6.45	6.86	2.07	3.42	3.30	3.94	3.55	43.12
Ithaca	3.19	1.30	2.30	3.43	2.63	6.74	6.73	3.32	2.57	3.62	3.35	2.46	41.64
Kingston	4.60	1.98	0.87	2.71	3.30	5.46	9.05	2.83	4.24	4.12	6.07	4.41	49.64
Le Roy	3.59	1.73	1.27	3.11	2.32	....	....	....	....	....	....	....	....
Lyons	2.02	2.59	2.10	3.39	3.15	6.22	6.03	1.83	2.72	3.58	3.90	1.88	39.41
Madison Barracks	2.42	1.18	0.70	4.90	8.25	11.50	3.91	0.89	3.08	3.08	10.02	5.80	55.73
Middleburgh	4.45	2.05	1.50	3.20	3.35	4.10	4.45	2.85	3.00	2.40	4.45	2.75	38.55
Mount Morris	....	....	1.40	2.15	2.93	7.30	3.09	2.80	....	....	....	....	....
New York	5.38	3.07	4.09	5.90	3.25	2.38	9.63	3.39	7.43	2.53	9.82	1.81	58.68
New York (Central Park)	4.97	2.21	2.64	5.47	2.89	2.39	11.89	3.28	6.92	2.61	9.97	1.92	57.16
Nineveh	1.92	3.18	1.65	2.78	2.63	12.10	6.25	3.60	5.35	3.95	7.85	3.45	54.71
North Hammond	2.64	1.01	0.22	2.17	2.35	7.36	4.08	1.78	2.48	3.49	3.80	4.11	35.49
Number Four	8.27	5.42	2.41	2.38	3.10	8.49	5.02	3.80	3.65	4.30	5.26	4.26	56.36
Oswego	4.25	2.17	0.55	2.85	1.61	9.81	3.02	1.02	2.52	3.57	5.43	3.30	40.10
Palermo	3.48	2.83	2.59	2.05	1.17	7.17	3.61	1.20	2.70	3.28	4.11	2.23	36.42
Perry City	4.65	2.03	1.93	2.55	3.34	6.49	7.07	3.04	3.54	3.83	5.30	3.08	46.85
Plattsburgh Barracks	1.75	0.32	0.08	1.70	2.83	4.17	5.62	1.43	4.25	3.34	2.57	2.03	30.09
Potsdam	3.42	4.66	1.48	4.18	3.36	7.35	7.87	[2.00]	3.05	4.42	4.10	3.75	[49.64]
Queensbury	4.72	1.76	1.53	1.88	3.60	4.91	5.08	2.55	3.13	[3.30]	5.03	4.13	[41.62]
Rochester	3.33	2.41	1.78	2.84	2.36	5.36	3.08	1.12	2.21	4.02	4.62	2.57	35.70
Rome	....	....	....	....	2.09	6.24	6.56	1.67	3.97	3.12	5.35	4.55	....
Saranac Lake	5.43	3.59	2.96	2.15	2.28	5.85	4.25	2.72	3.69	4.17	2.21	3.12	42.42
Savona	2.73	1.37	1.20	3.10	6.04	3.54	5.44	2.76	2.25	3.00	4.95	[3.80]	[40.18]
Setanket	6.26	2.19	2.74	3.57	3.83	2.91	6.64	4.16	7.22	4.64	8.03	1.68	53.87
South Canisteo	[3.20]	[1.40]	[1.30]	4.96	5.90	7.19	9.25	3.12	4.57	4.59	6.35	4.00	[55.83]
S. E. Reservoir	4.84	....	....	4.23	3.17	3.67	11.71	3.43	7.14	3.35	8.73	....	....
South Kortright	[4.20]	0.86	1.38	2.55	4.18	6.02	5.52	3.26	3.80	3.31	4.42	1.94	[41.44]
Tannersville	....	....	....	....	15.02	9.80	10.30	3.71	8.12	4.49	....	....	....
Turin	....	....	....	....	....	....	....	1.25	3.61	3.82	5.11	5.14	....

Utica (1)	*6.17*	*4.94*	*2.48*	*2.56*	*2.44*	*6.58*	*6.10*	*2.28*	*3.67*	*2.71*	*4.43*	*4.21*	*48.57*
Utica (2)	*4.32*	*4.04*	*3.25*	*2.71*	*2.49*	*9.19*	*5.49*	*1.72*	*3.93*	*3.91*	*3.83*	*3.31*	*48.19*
Watervliet Arsenal	2.08	2.20	1.85	1.20	4.20	10.30	5.55	5.35	5.00	3.20	5.65	3.20	49.78
Wedgewood	3.53	2.28	1.14	3.02	3.17	6.70	7.16	4.73	2.34	3.31	4.88	2.40	44.66
West Point	5.08	2.88	1.50	4.56	3.00	3.32	9.92	4.09	6.42	4.85	8.08	3.06	56.76
White Plains	4.32	3.19	3.50	4.20	2.28	3.91	14.07	4.78	4.35	3.03	11.66	2.21	61.50
Willets Point	6.08	2.33	2.20	7.15	2.60	2.38	7.13	4.02	7.16	2.82	10.28	1.78	55.93
North Carolina:													
Asheville (1)	3.45	1.42	1.28	1.15	5.29	4.51	5.81	5.46	3.89	0.46	5.06	0.98	38.76
Asheville (2)	2.59	1.68	0.43	1.45	5.47	4.77	5.39	5.81	4.28	0.49	4.72	0.97	38.05
Chapel Hill	6.71	4.24	2.33	3.75	6.02	......	......	......	......	3.32	3.23	0.46	......
Charleston	4.77	3.80	1.84	1.74	3.47	3.79	6.56	8.01	3.56	0.82	5.39	1.50	45.25
Charlotte	6.15	4.59	1.62	2.60	2.75	10.54	8.17	4.53	2.88	1.53	4.44	0.48	50.28
Clear Creek	......	......	......	......	......	......	8.20	4.38	5.10	2.70	5.40	0.35	......
Fayetteville	......	......	......	1.77	3.52	5.03	14.04	6.96	3.68	......	......	......	......
Franklin	......	......	......	......	......	......	5.35	3.10	4.75	0.45	4.50	0.90	......
Goldsborough	......	......	......	......	4.70	7.82	7.30	3.83	3.30	2.80	3.05	......	......
Grover	......	......	......	......	0.30	1.59	3.60	0.77	0.35	......	......	......	......
Hatteras	6.82	4.52	5.43	10.08	6.03	11.91	2.26	5.30	5.09	4.84	4.70	0.26	67.24
Highlands	......	......	......	......	......	3.78	5.59	4.33	8.90	0.80	6.38	1.38	......
Kitty Hawk	5.59	2.82	3.52	9.56	2.54	8.05	5.46	6.89	[4.00]	[5.50]	5.68	0.30	[59.91]
Lenoir	3.50	2.40	1.40	2.20	6.60	5.90	9.00	4.20	5.30	0.70	[5.00]	0.50	[46.70]
Lumberton	......	......	......	......	3.13	6.80	8.65	7.61	1.58	1.34	3.51	......	......
Morganton	[3.40]	*n*2.58	1.60	2.17	6.17	4.29	6.97	4.00	4.89	0.50	6.95	0.45	[43.97]
Monroe	6.00	3.71	2.74	1.78	3.11	6.97	6.54	4.34	5.93	2.69	5.48	0.64	49.93
Mount Airy	......	......	......	3.41	5.10	4.53	10.38	5.14	5.01	1.16	4.48	0.92	......
Mount Holly	6.17	3.86	2.00	2.40	2.56	7.94	7.84	2.80	3.44	2.75	4.67	[0.90]	[47.33]
Mount Pleasant	6.06	3.77	2.15	2.20	2.91	6.02	8.28	4.51	3.95	3.15	5.95	0.60	49.55
Murphy	6.01	5.71	2.35	2.33	3.75	6.48	7.11	6.09	3.93	2.16	6.75	1.53	54.20
New Berne	5.80	2.65	2.90	[2.50]	6.12	6.41	8.44	2.89	2.71	3 16	3.59	0.30	[47.47]
Pittsborough	......	......	......	......	......	4.38	8.50	4.70	2.50	3.10	4.30	0.40	......
Raleigh (1)	6.02	3.36	2.72	4.01	5.30	10.44	6.04	8.74	1.68	3.41	3.07	0.60	55.39
Raleigh (2)	[6.00]	2.64	2.40	3.40	4.55	8.20	[7.50]	6.43	1.70	2.40	1.95	0.40	[47.57]
Salisbury	5.90	3.33	3.30	2.85	3.01	5.57	7.25	6.13	3.40	2.18	4.96	0.50	48.38
Smithfield	......	......	......	......	......	......	......	5.60	3.80	2.00	3.00	......	......
Soapstone Mountain	......	......	......	......	......	13.75	10.00	6.25	4.12	3.00	5.50	0.50	......
Southern Pines	[5.50]	3.65	3.65	5.56	5.00	3.90	[9.00]	[8.50]	2.50	4.00	4.20	1.00	[56.46]
Southport	6.18	3.11	5.01	2.04	3.04	6.62	6.22	3.78	1.80	4.98	2.18	0 10	45.06
Statesville	4.90	6.66	2.14	2.78	3.11	6.20	13.61	7.90	4 78	[1.50]	[4.80]	[0.80]	[59.18]
Wadesborough	......	......	......	......	4.18	4.75	9.96	9.75	0.85	1.20	3.25	......	......
Wake Forest	......	12.25	3.23	4.34	3.91	......	......	......	......	......	......	......	......

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
North Carolina—Continued.													
Washington	......	......	......	3.47	5.60	6.47	10.08	9.40	......	......	......	0.40	......
Weldon (1)	......	......	......	......	8.45	12.01	11.91	3.49	3.25	3.40	2.61	......	......
Weldon (2)	4.67	3.53	3.87	6.59	8.48	8.82	8.59	3.54	3.26	3.39	2.61	0.80	58.15
Wilmington	6.85	4.66	5.57	2.13	4.24	6.03	11.10	7 81	3.18	3.87	3.72	0.15	59.31
Winslow	......	......	......	......	......	......	......	3.70	3.90	1.95	2.80	0.70	......
North Dakota:													
Bismarck	0.50	1 48	0.55	0.26	3.35	1.03	2.01	0.53	0.48	T.	0.15	0.69	11.03
Carrington	......	......	0.17	1.07	1.93	1.92	3.03	2.37	......	......	......	......	......
Davenport	0.58	0.65	0.05	1.23	1.68	0.84	1.50	2.44	5.09	0.02	0.19	0.70	14.97
Fort Abraham Lincoln	0.10	0.45	0.70	0.00	3.61	2.08	1.45	0.65	0.54	0.00	0.08	0.60	10.26
Fort Buford	0.13	0.30	0 20	0.60	2.69	1.03	0.63	0.95	1.13	0.01	0.37	0.42	8.46
Fort Pembina	0.34	0.48	0.32	0.71	0.10	1.42	1.66	2.34	2.88	0.30	0.18	1 02	11.75
Fort Totten	0.24	0.64	0.16	0.78	0.62	1.56	2.05	2.69	1.62	T.	0.19	?0.00	10.55
Fort Yates (1)	0.87	1.00	0.33	1.14	3.29	1.74	3.99	0.28	0.83	0.21	0.03	0.34	14.05
Fort Yates (2)	0.45	0.60	0 40	0.21	3.37	1.21	3.41	0 28	0.69	0.10	0.07	0.28	11.07
Napoleon	......	......	......	......	2.45	1.43	2.85	1.74	2.29	T.	0.13	0.69	......
New England City	0.50	0.85	0.02	0 84	2.18	0.94	2.58	0.70	0.47	T.	0.07	0.40	9.55
Steele	......	......	......	0.57	3.65	1.28	2.24	0.44	......	0.06	0.20	0.65	......
Wahpeton	......	......	......	......	......	......	0.94	1.30	1.97	0.00	T.	0.18	......
Ohio:													
Akron	2.61	1.06	2.36	1.70	3.34	6.34	2.42	1.83	4.42	1.42	3.09	3.37	33.96
Ashland	2.90	1.41	2.01	1.95	2.83	6.04	4.23	2.33	3.10	0.89	3.75	3.59	35.03
Athens	2.33	1.78	1.36	2.58	2.44	5.33	7.70	1.20	3.43	2.42	4.55	2.63	37.75
Bangorville	4.34	1.43	1.06	1.69	4.64	4.54	3.82	2.37	3.52	1.18	3.59	3.22	35.40
Bellevue	2.59	1.40	2.80	1.55	5.55	2.68	2.16	3.43	1.76	0.84	2.57	2.88	30.21
Caledonia	3.26	0.77	0 81	2.19	4.93	4.64	6.80	1.41	3.81	0.71	2.83	2.41	34.57
Canton (1)	3.50	1.05	1 38	3.09	2.81	4.89	7.34	3.02	3.66	2.04	3.82	3.48	40.08
Canton (2)	3.42	1.13	1.38	3.09	2.81	4.89	7 34	3.02	3.73	2.04	3.83	3.66	40.34
Carrollton	[3.00]	[1.00]	1.28	1.42	2.09	4.90	3.30	2.30	3.10	2.10	4.90	3.90	[33.29]
Celina	2.90	1.38	0.90	3.15	4.47	3.68	3.93	1.30	2.82	0.52	3.46	2.30	30.81
Cincinnati	2.38	1.72	0.61	1.21	2.52	4.03	4.55	0.26	4.31	2.03	5.28	2.02	30.92
Circleville (1)	2.75	1.07	0.54	1.42	3.90	3.47	5.63	0.59	4.46	2.30	6.07	2.08	34.28
Circleville (2)	3.42	1.54	0.69	1.36	4.37	4.05	5.74	0.90	5.33	2.51	5.01	1.79	36.71

Clarksville	*2.33*	*1.23*	*0.71*	*0.79*	*2.95*	*4.63*	*2.28*	*1.13*	*4.98*	*2.21*	*4.96*	*2.73*	*30.93*
Cleveland (1)	*3.13*	*1.24*	*2.07*	*1.99*	*4.13*	*1.65*	*4.32*	*1.23*	*4.29*	*1.56*	*3.72*	*3.24*	*32.57*
Cleveland (2)	*3.03*	*1.20*	2.30	2.04	4.16	2.42	2.65	1.33	5.10	1.91	2.91	2.95	32.00
College Hill	3.70	1.90	1.70	0.38	5.85	7.60	5.85	0.50	5.85	3.29	6.42	1.50	44.54
Collinwood	2.47	0.95	2.31	2.47	4.01	2.55	5.06	1.08	4.35	[1.50]	[3.40]	[3.30]	[33.45]
Columbus	3.37	1.06	0.66	0.83	3.92	2.77	2.94	1.59	3.34	1.83	3.83	2.36	28.50
Columbus Barracks	4.90	1.24	1.58	1.10	5.56	2.68	2.80	2.13	3.76	1.79	3.74	2.04	33.32
Dayton	3.28	0.51	0.98	0.55	4.35	3.35	3.11	0.34	2.06	1.51	4.05	2.69	26.78
Demos	3 04	1.82	1.17	2.51	2.81	5.04	4.05	1.21	3.52	2.05	5.42	3.03	35.67
Ellsworth	3.11	....	2.47	3.16	2.24	3.27	2.07	1.98	4.04	....	....	....	....
Elyria	3.16	2.15	3.05	1.80	3.06	2.63	3.19	2.95	4.20	1.72	2.87	3.65	34.43
Findlay	....	....	....	....	....	....	....	....	2.70	0.92	2.93	3.59	....
Fostoria	1.14	0.76	1.05	[1.40]	6.43	4.90	4.38	0.87	[1.80]	0.85	2.40	3.95	[29.93]
Garrettsville	3.11	1.42	3.11	2.06	2.65	5.24	1.69	3.88	5.18	1.67	2.55	3.81	36.37
Georgetown	3.53	2.22	0.98	1.28	2.33	4.89	4.58	1.51	7.12	3.34	5.91	1.68	39.37
Granville	3.79	1.25	1.07	1.43	2.90	3.30	3.76	0.73	3.91	2.23	4.50	[2.20]	[31.07]
Gratiot	....	....	....	....	....	....	....	1.22	4.58	1.41	4.92	1.90	....
Greenville	2.48	0.92	1.38	1.29	5.57	4.58	4.31	0.55	3.66	1.24	4.03	2.77	32.78
Hanging Rock	3.49	1.48	1.68	2.00	4.16	4.60	5.93	2.22	3.62	3.71	3.79	1.58	38.26
Hiram	2.71	1.31	2.82	2.19	2.48	5.80	2.35	2.22	5.61	1.52	2.25	4.03	35.29
Hudson	1.74	1.32	2.76	2.27	2.62	[5.80]	[3.00]	2.52	5.87	2.18	2.63	4.34	[37.05]
Jacksonborough	2.60	0.60	0.40	0.50	4.20	3.60	2.45	0.60	2.45	2.05	4.12	2.05	25.62
Jefferson	4.06	1.82	2.00	2.45	3.24	2.60	4.10	0.94	4.33	2.71	4.29	3.92	36.46
Kent	[3.90]	1.67	2.82	2.57	4.18	5.69	3.49	2.60	5.72	1.95	2.80	3.69	[41.08]
Kenton	2.60	1.28	0.91	2.49	5.06	7.37	4.59	1.45	2.41	0.96	3.60	2.42	35.14
Logan	3.66	1.39	1.52	2.01	2.24	3.61	10.83	0.85	3.30	2.02	5.11	2.76	39.30
Lordstown	3.20	1 06	2.18	2.83	2.20	3.76	2.35	1.70	2.65	1.98	2.21	3.09	29.21
McConnelsville	3.43	2.00	0.93	2.35	3.19	4.45	4.22	0.91	3.82	2.09	4.37	2.42	34.18
Mansfield	4.15	1.52	0.88	2.81	4.33	4.88	3.96	3.05	4.03	1.04	3.85	3.66	38.16
Marietta (1)	3.28	2.44	1.09	2.79	3.07	4.04	9.50	1.81	3.18	1.77	5.46	2.52	40.95
Marietta (2)	3.29	2.51	1.99	3.18	2.77	3.97	7.86	3.47	2.78	1.83	4.71	2.43	40.79
Napoleon	2.12	1.21	2.09	1.60	5.05	3.98	4.95	1.47	1.70	0.98	3.02	2.27	30.44
New Alexandria	3.60	2.20	1.90	3.03	3.46	3.35	4.84	1.12	2.47	1.55	4.63	2.67	34.82
New Athens	....	....	....	....	....	5.97	6.23	2.00	3.50	2.50	....	....	....
New Comerstown	4.06	1.65	0.95	2.55	2.49	3.06	4.91	1.09	4.55	1.58	4.44	2.16	33.49
North Lewisburgh	4.80	0.90	0.75	1.50	2.75	3.80	3.25	1.55	3.75	0.80	4.20	3.00	31.05
Oberlin	2.00	1.53	3.19	0.49	4.46	1.37	2.18	1.73	4.46	1.16	2.42	3.55	28.54
Ohio State University	3.90	0.91	1.00	1.11	3.45	2.08	2.68	2.07	3.77	1.77	3.71	2.24	28.69
Orangeville	[3.20]	[1.30]	2.60	2.60	2.70	3.35	1.80	1.80	3.80	2.30	1.95	2.85	[30.25]
Ottawa	1.94	0.84	1.81	2.04	4.59	3.40	1.74	1.06	1.66	0.67	2.53	2.64	24.92
Poland	[3.30]	[1.10]	[2.50]	3.05	3.15	4.96	3.01	2.25	4.48	1.74	3.77	5.32	[38.63]

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Ohio—Continued.													
Pomeroy	2.05	1.90	0.71	2.80	2.48	3.58	7.05	0.66	3.66	2.03	3.79	1.54	32.25
Portsmouth (1)	4.07	1.95	1.68	2.23	3.27	4.32	7.56	0.92	3.49	3.36	4.22	2.25	39.32
Portsmouth (2)	4.08	1.99	1.68	2.04	3.43	4.17	7.71	0.91	3.47	3.36	4.19	2.25	39.28
Salineville	....	....	1.90	1.11	5.20	....	....	....	....	1.10	....	....	....
Sandusky	2.43	1.27	2.23	1.45	4.52	2.29	0.98	1.25	1.84	1.27	1.71	3.65	24.89
Shiloh	....	....	....	....	6.10	3.45	3.40	2.45	3.00	0.55	3.75	3.05	....
Sidney	3.59	1.27	1.01	1.58	5.20	5.55	8.32	3.74	4.48	1.05	6.56	4.14	46.49
Springborough	3.48	1.00	0.87	0.85	3.95	2.75	2.74	0.81	2.53	2.58	3.73	3.63	28.92
Tiffin	2.85	1.22	2.96	1.47	4.36	2.47	2.23	0.71	2.00	1.02	2.48	3.60	27.37
Toledo	1.50	0.97	1.87	1.32	3.93	3.26	1.14	1.59	0.52	0.84	2.28	2.62	21.84
Upper Sandusky	3.27	1.58	1.28	2.33	5.54	5.75	3.35	2.09	2.68	0.56	2.76	2.52	33.71
Vienna	[3.10]	[1.10]	1.15	2.27	2.38	2.95	2.34	2.55	3.15	1.54	1.71	2.48	[26.72]
Wapakoneta	0.64	0.77	0.55	0.79	3.43	3.37	[4.10]	0.40	1.80	0.50	4.65	1.45	[22.45]
Wauseon	2.17	1.77	2.96	1.90	8.22	3.69	4.82	1.54	0.79	0.93	3.67	2.87	35.33
Waverly	....	....	....	....	....	4.87	5.44	2.22	4.66	3.08	4.40	1.70	....
Waynesville	3.69	0.86	2.53	0.69	3.75	3.49	2.31	0.84	[2.60]	2.33	5.05	3.11	[31.25]
Westerville	3.67	1.00	0.91	1.06	3.07	3.10	3.89	1.38	3.21	1.51	3.69	2.75	29.24
West Milton	5.78	2.40	2.65	1.70	7.63	6.55	5.85	1.40	4.05	2.45	7.62	4.25	52.33
Weymouth	2.86	1.71	2.47	3.13	3.61	5.19	3.23	1.64	4.14	1.73	2.59	3.86	36.16
Wooster (1)	3.73	1.97	2.14	1.63	2.98	4.85	6.73	1.98	4.05	1.41	3.51	3.88	38.86
Wooster (2)	4.33	2.42	2.13	1.58	2.97	4.86	6.73	1.98	4.05	1.36	3.53	3.93	39.87
Yellow Springs	3.83	0.70	0.91	1.17	4.83	5.06	2.07	0.57	2.27	1.29	4.55	2.83	30.08
Youngstown	3.39	0.42	1.90	2.84	3.64	4.99	1.83	1.35	4.25	1.97	2.71	3.43	32.72
Zanesville	3.25	1.50	0.47	2.13	1.65	4.30	[2.90]	1.14	3.27	1.66	4.65	2.06	[28.98]
Oregon:													
Albany	3.96	0.95	2.28	4.12	3.05	0.55	0.00	1.18	1.74	6.50	2.95	6.58	33.86
Ashland (1)	....	....	....	1.77	2.09	0.34	1.34	0.11	0.00	3.26	....	....	....
Ashland (2)	0.50	[0.60]	0.50	1.25	1.90	0.10	1.25	0.00	0.00	1.97	2.45	2.29	[12.81]
Astoria	10.67	2.84	5.18	5.59	3.06	2.75	0.10	3.78	5.59	9.64	7.61	8.22	65.03
Baker City	....	....	....	....	....	....	T.	T.	0.19	1.46	1.08	1.44	....
Bandon	6.76	2.57	6.33	4.10	6.89	0.57	0.17	0.73	1.60	11.80	5.65	11.80	58.97
Beulah	....	....	....	....	....	....	....	....	T.	1.11	0.99	1.92	....
Cascade Locks	4.54	2.79	3.39	5.38	4.34	1.89	0.00	1.00	4.95	6.52	6.80	[5.70]	[47.30]

Corvallis	....	....	....	*3.55*	....	....	*0.56*	....	....	....	*2.98*	*6.44*	....
Creswell	....	....	....	4.44	4.68	0.94	0.00	1.07	1.33	5.57	5.58	....	....
East Portland	4.10	0.16	1.22	2.08	4.11	0.53	T.	0.90	0.68	5.23	3.04	2.28	24.33
Eola	3.08	0.35	2.84	2.33	2.77	0.45	0.00	1.39	1.80	5.10	3.23	5.23	28.57
Fort Klamath	1.61	0.04	1.48	4.95	1.24	0.41	0.27	....	....	....	....	....	....
Gardiner	....	....	....	5.74	5.90	1.51	1.95	1.35	2.92	10.23	5.62	....	....
Grant's Pass	[3.20]	[0.80]	3.40	1.33	3.02	†0.09	0.00	0.09	0.04	3.71	5.74	6.65	[28.07]
Heppner	....	....	....	....	....	0.66	0.12	0.10	0.16	0.88	0.55	1.25	....
Hood River	....	....	....	....	....	....	....	....	1.39	1.92	3.11	4.32	....
Jacksonville	....	....	....	1.00	1.80	0.16	0.00	0.25	T.	2.04	3.87	....	....
La Grande	....	....	....	2.31	5.34	1.31	0.33	0.04	0.46	2.28	....	....	....
Lone Rock	....	....	....	1.57	4.36	0.85	0.53	0.03	....	....	0.66	....	....
McMinnville	4.52	0.93	2.20	3.19	....	....	....	....	2.40	5.21	4.13	6.51	....
Mount Angel	3.50	0.80	2.26	4.84	3.67	0.44	0.00	1.34	2.16	5.39	3.70	5.98	34.08
Portland	4.78	1.07	1.80	2.72	4.02	0.51	T.	0.90	1.61	4.59	3.97	5.79	31.76
Roseburgh	2.96	0.70	2.24	1.57	2.67	0.14	0.00	0.45	0.24	5.28	5.26	6.61	28.12
St. Helens	....	....	....	....	....	....	....	....	2.40	5.58	5.04	5.00	....
Siskiyou	1.40	0.20	3.30	1.20	5.33	[0.35]	0.85	0.00	0.00	6.26	3.90	7.34	[30.13]
The Dalles	....	....	....	0.42	0.66	0.29	T.	T.	0.16	0.90	1.27	....	....
Tillamook	8.75	3.54	5.24	5.34	5.32	3.26	0.14	2.30	7.51	11.00	6.23	10.24	68.87
Pennsylvania:													
Allegheny Arsenal	2.96	1.50	2.40	2.92	6.50	5.70	5.52	1.90	2.79	2.07	4.40	2.99	41.65
Altoona	1.82	1.24	2.37	3.44	4.75	4.73	4.60	1.52	2.74	2.38	4.02	3.42	37.03
Aqueduct	[3.00]	2.48	3.98	3.39	9.55	4.85	5.86	3.10	3.55	2.83	6.56	2.45	[51.60]
Bethlehem	[4.00]	1.94	[3.60]	4.29	4.30	5.28	9.93	4.10	6.14	3.29	8.71	1.66	[57.24]
Blooming Grove	4.30	3.66	3.60	6.70	5.40	6.70	11.00	4.70	8.30	6.10	8.90	3.00	72.36
Blue Knob	[2.20]	[2.00]	[2.40]	k4.81	10.52	2.30	6.20	2.20	†4.70	4.70	9.70	0.58	[52.31]
Brookville	2.93	2.34	2.30	5.28	6.09	9.36	4.13	2.82	3.40	2.36	3.72	2.37	47.10
Cannonsburgh	....	....	....	....	....	....	....	1.64	3.41	2.87	4.91	3.30	....
Carlisle	3.49	1.68	1.91	4.56	4.52	4.59	[6.20]	2.49	[4.30]	3.75	9.03	2.44	[48.96]
Catawissa	3.22	1.61	2.99	4.42	[5.80]	[6.70]	6.62	6.17	4.47	2.82	6.95	2.41	[54.18]
Chambersburgh	....	....	....	....	....	....	....	....	4.13	3.24	5.73	2.03	....
Charlesville	3.74	1.53	4.16	4.76	11.07	4.26	4.19	1.06	[2.20]	[2.10]	5.03	1.63	[46.23]
Clarion (1)	3.77	2.29	2.27	4.53	3.84	8.12	6.21	2.85	3.51	4.47	3.61	3.78	49.25
Clarion (2)	3.35	2.10	1.91	2.09	4.59	[8.00]	[6.00]	[2.80]	3.32	2.17	3.73	3.61	[48.67]
Coatesville	4.33	1.85	4.49	7.08	5.29	5.99	12.93	3.05	9.12	4.61	8.60	1.60	68.94
Confluence	1.99	2.63	1.98	3.21	4.46	4.69	4.22	3.38	1.90	3.33	4.82	3.35	39.96
Coudersport	4.80	1.90	....	4.50	7.90	4.80	....	3.80	2.90	....	3.80	....	....
Corry	3.22	1.53	1.63	3.24	2.88	5.12	2.00	2.37	5.25	3.44	4.00	5.09	39.77
Doylestown	....	....	....	....	4.82	5.82	11.87	4.28	8.61	4.27	10.05	2.30	....
Drifton	....	1.46	2.61	5.89	6.80	4.99	9.55	4.77	....	5.74	....	....	....

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Pennsylvania—Continued.													
Dyberry	3.60	*0.85	1.74	4.55	4.72	4.24	6.53	2.85	4.18	3.75	5.80	2.91	45.72
Eagle's Mere	4.92	3.87	1.85	5.71	9.21	[6.90]	6.30	2.82	9.35	8.61	9.27	3.28	[72.09]
Easton	5.36	2.26	3.61	5.21	6.08	3.77	10.48	5.27	6.40	4.51	9.90	1.12	63.97
Emporium	2.75	1.61	1.44	3.66	8.04	4.63	7.03	3.23	2.84	3.70	5.11	3.85	47.89
Erie	2.71	1.57	1.73	3.64	2.51	6.02	1.68	2.26	4.85	3.37	3.29	4.03	37.66
Forks of Neshaminy	[4.20]	[3.20]	3.35	4.68	5.70	4.49	10.36	5.30	8.76	4.77	7.43	1.65	[63.89]
Frankford Arsenal	3.65	1.87	3.69	3.75	4.43	3.00	9.59	5.00	7.40	4.15	8.00	1.70	56.23
Franklin	4.12	1.68	1.56	3.10	2.19	5.25	8.86	2.12	4.39	3.10	2.88	4.53	43.78
Frederick	......	......	......	......	4.65	6.41	12.69	3.83	6.68	4.62	7.63	1.88	......
Freeport	2.86	1.90	2.62	4.04	1.80	3.58	8.22	3.19	4.19	2.99	5.37	3.45	44.21
Germantown	3.82	2.01	3.28	3.03	5.73	3.27	10.50	6.60	5.51	5.41	7.73	0.91	57.80
Girardville	[3.30]	1.66	2.77	7.23	6.93	8.01	9.46	6.03	6.50	4.41	10.16	3.31	[69.77]
Grampian Hills	3.22	1.96	3.12	4.61	11.60	3.71	7.33	4.00	2.76	3.21	3.86	4.67	54.05
Greensborough	2.47	2.28	2.64	2.58	4.63	6.79	4.37	3.95	3.04	2.87	7.50	2.56	45.68
Greenville	3.52	1.18	[2.60]	2.50	2.57	3.51	1.04	1.83	3.68	2.74	2.72	3.03	[30.92]
Harrisburg	2.86	1.48	3.26	3.96	9.51	7.18	8.68	3.58	4.53	3.33	6.59	2.11	57.07
Hollidaysburgh	2.56	1.91	3.69	4.07	7.43	2.71	6.22	1.37	3.01	2.90	6.00	3.36	45.23
Honesdale	4.15	2.10	1.88	5.55	5.47	3.13	5.55	2.60	5.90	4.02	5.31	3.53	49.19
Huntingdon	2.84	0.97	3.17	4.42	7.18	5.60	5.38	1.80	4.53	3.67	6.65	3.14	49.35
Indiana	2.94	2.42	1.47	4.50	4.71	3.39	[4.80]	[2.80]	4.60	3.53	5.20	[3.10]	[43.46]
Johnstown (1)	3.11	3.05	2.22	7.60	6.15	......	......						
Johnstown (2)	......	......	......	......	......	......	......	3.95	4.59	2.55	5.33	4.62	......
Kennett Square	......	......	......	......	3.18	......	......	......	10.01	5.04	8.92	0.49	......
Lancaster	2.83	2.16	3.89	6.54	4.46	......	......	......	6.38	3.88	9.02	......	......
Lansdale	2.95	1.63	2.98	4.90	4.35	5.45	15.02	4.66	8.32	5.02	8.11	1.71	65.10
Le Roy	1.59	1.38	1.63	3.19	4.41	6.94	8.33	2.08	3.13	4.73	5.80	2.45	45.66
Lock Haven	3.48	1.74	2.63	3.97	......	......	......	......	4.73	......	6.96	4.19	......
Lock No. 4	2.61	1.67	2.56	4.27	5.84	5.67	3.29	2.18	5.01	3.27	5.96	2.77	45.10
McConnellsburgh	3.53	2.50	4.76	5.28	12.41	5.17	8.23	[2.50]	[2.10]	3.14	6.51	2.44	[58.57]
Mahoning	3.26	1.25	1.45	4.53	2.95	4.09	3.00	1.18	1.88	1.90	2.67	3.56	31.72
Meadville	3.20	1.60	3.00	2.98	2.30	[3.90]	2.82	1.64	7.02	2.07	[3.80]	[4.10]	[38.43]
Meshoppen	[2.70]	†0.95	[1.60]	3.12	2.53	4.34	6.40	0.48	2.25	3.03	[5.00]	1.13	[33.58]
Myerstown	......	......	......	......	5.47	8.66	......	3.07	3.45	4.47	9.99	2.20	......
New Bloomfield	3.52	1.24	3.91	3.88	6.06	6.25	6.08	2.75	5.02	4.35	7.31	2.24	52.61

New Castle	*3.17*	*3.33*	*2.73*	*6.06*	*3.20*	*6.50*	*[5.40]*	*2.28*	*4.01*	*1.88*	*2.89*	*3.64*	*[45.09]*
Nisbet	*[3.50]*	*1.80*	*1.45*	*3.30*	*4.80*	*6.20*	*5.10*	*2.80*	*3.40*	*4.20*	*7.70*	*4.00*	*[48.25]*
Oil City	1.81	0.29	1.50	3.98	3.85	7.04	4.30	1.65	3.43	3.17	2.12	1.63	34.77
Ottsville	4.30	2.67	4.42	4.64	5.85	7.58	13.19	5.13	7.38	5.09	8.87	1.97	71.09
Parker's Landing	3.07	1.88	2.03	2.92	1.78	4.42	5.24	3.06	3.79	3.28	4.00	4.06	39.53
Petersburgh	[2.60]	1.30	1.27	3.90	6.85	3.10	5.47	3.12	3.55	3.29	7.16	2.31	[43.92]
Philadelphia	3.75	2.00	2.58	3.17	4.32	3.39	8.29	7.07	4.66	3.76	6.76	0.85	50.60
Philipsburgh	2.41	1.87	2.27	6.09	5.28	5.84	5.21	2.40	2.91	3.54	5.22	3.68	46.72
Pittsburgh	2.50	1.58	2.32	3.62	6.45	4.93	5.48	1.88	2.87	2.06	4.61	3.07	41.37
Pleasant Mount	[4.20]	7.95	2.60	5.25	6.90	7.15	7.59	3.90	3.40	4.50	6.05	3.12	[62.61]
Point Pleasant	4.64	2.20	3.45	5.11	5.59	5.32	12.30	3.75	8.14	5.06	8.63	1.69	65.88
Pottstown	4.12	1.92	3.73	6.15	7.47	6.20	12.50	5.05	8.44	4.56	9.50	[2.80]	[72.44]
Quakertown	4.58	2.38	3.37	4.83	5.55	7.31	11.54	4.70	8.06	5.23	8.88	2.43	68.86
Reading	3.74	1.66	3.72	6.33	4.10	8.21	9.30	3.35	4.08	5.74	8.83	2.94	62.00
Salem Corners	3.87	2.64	2.25	6.56	3.82	6.47	6.74	3.31	5.50	4.31	5.96	3.91	55.34
Saltsburgh	2.39	2.26	2.91	4.67	5.40	4.93	3.03	2.79	3.93	2.30	5.43	3.69	43.73
Seisholtzville	4.28	2.13	3.59	6.22	4.54	7.91	11.76	4.15	7.32	5.17	9.70	1.53	68.30
Selin's Grove	4.00	1.52	2.60	3.02	9.20	5.10	4.29	6.00	5.16	3.65	9.13	2.66	56.33
Smith's Corners	4.19	2.22	3.35	5.02	4.75	7.54	12.30	4.88	8.07	4.99	9.06	2.36	68.73
Somerset	3.48	3.13	2.52	4.55	8.32	3.87	5.06	3.35	2.94	2.61	7.22	4.29	51.34
South Eaton	....	....	....	....	....	....	....	....	3.32	4.11	5.52	2.32	....
State College	1.97	1.34	2.53	3.54	4.98	5.77	4.68	3.15	3.67	3.36	6.48	3.29	44.76
Swarthmore	4.80	1.92	3.43	3.51	5.84	5.48	8.74	3.52	8.04	5.29	6.74	1.05	58.36
Tipton	....	....	....	4.71	6.48	3.50	....	....	....	2.82	6.12	4.10	....
Troy	2.98	1.92	[2.20]	2.92	1.42	3.44	6.21	0.89	3.22	3.15	5.84	3.06	[37.25]
Tuscarora	[3.26]	1.27	3.57	4.06	8.28	6.63	6.95	3.47	5.52	3.43	6.68	2.34	[55.46]
Uniontown	2.34	2.43	3.60	4.47	6.93	7.36	4.81	3.86	3.79	3.31	8.90	2.76	54.56
Warren	2.77	1.44	0.77	5.00	1.76	3.86	5.42	3.41	3.67	3.66	3.53	4.47	39.76
Wellsborough	8.20	2.98	3.24	8.15	3.45	10.04	3.06	0.83	2.71	5.56	9.07	3.93	61.22
West Chester	4.78	2.46	5.44	5.46	5.78	5.38	12.57	4.43	9.95	4.97	9.91	1.95	73.08
Westtown	3.51	1.74	....	....	....	....	....	....	....	5.37	8.13	1.23	....
Wilkes Barre	....	....	....	....	....	....	....	....	5.79	3.16	6.39	2.72	....
Wysox	2.70	1.73	1.73	3.78	4.76	4.86	5.17	2.07	3.21	3.16	5.02	2.51	40.70
York	[4.30]	[2.20]	[3.40]	3.91	5.65	5.13	4.34	2.83	6.87	4.03	8.28	1.05	[51.99]
Rhode Island:													
Block Island	2.16	1.57	2.30	2.10	3.21	2.84	2.92	3.37	3.41	3.11	4.86	0.95	32.80
Bristol	5.82	2.35	2.13	3.36	5.40	2.59	6.63	5.40	4.41	4.99	6.01	1.39	50.48
Fort Adams	3.74	1.74	7.54	1.44	4.96	3.98	5.28	4.41	3.56	4.39	5.10	0.92	47.06
Kingston (1)	[5.30]	[2.60]	[2.30]	4.20	3.58	3.66	8.30	4.57	4.61	3.02	7.52	2.76	[52.42]
Kingston (2)	8.27	2.92	4.70	4.14	6.06	4.25	8.70	5.50	5.52	5.18	7.38	2.91	65.53

* Incomplete.

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Rhode Island—Continued.													
Lonsdale	5.92	2.02	1.63	3.86	4.98	2.60	9.90	4.51	4.48	4.93	5.90	2.88	53.61
Narragansett Pier	6.52	3.03	3.66	3.46	5.49	4.35	7.32	5.27	3.79	5.23	7.18	2.29	57.59
Pawtucket	5.72	2.40	1.16	4.41	5.67	3.02	10.68	5.97	4.78	5.01	6.85	2.92	58.59
Providence (1)	5.62	2.55	1.98	4.07	4.71	2.90	9.49	5.83	5.23	4.52	6.39	2.62	55.91
Providence (2)	4.91	2.06	2.02	3.44	4.82	2.35	[5.80]	[5.30]	5.03	4.58	6.01	2.72	[49.04]
Woonsocket	5.61	1.45	1.70	4.97	3.73	[2.20]	11.41	4.36	4.67	5.21	6.29	2.98	[54.58]
South Carolina:													
Aiken	8.79	5.33	3.79	4.10	1.13	....	....	....	....	....	2.58	1.07	....
Allendale	....	....	....	....	2.35	5.02	6.16	2.65	2.81	1.33	2.45	....	....
Batesburgh	....	....	....	....	1.50	6.74	9.08	6.33	2.90	2.91	3.64	....	....
Belmont	[6.60]	6.80	3.12	2.06	1.17	6.06	6.23	5.36	2.66	0.93	5.00	0.69	[46.68]
Blackville	....	....	....	....	1.78	6.60	6.52	5.66	3.52	2.17	2.80	....	....
Branchville	....	....	....	....	2.08	2.29	5.53	4.23	1.88	0.80	1.96	....	....
Brewer's Mines	7.10	4.41	3.40	0.69	2.72	2.38	7.58	8.17	2.58	3.86	5.58	0.60	49.07
Cedar Springs	6.81	5.60	1.65	2.05	2.33	2.61	8.33	5.10	5.30	0.30	[4.40]	[0.60]	[45.11]
Charleston	6.46	4.54	7.49	2.41	0.98	5.96	6.74	7.36	2.17	0.73	7.28	0.03	52.15
Cheraw	....	....	....	....	3.79	4.57	10.89	10.01	3.95	3.14	3.78	0.20	....
Chester	....	....	....	....	0.50	6.40	5.67	4.32	1.91	0.70	0.66	....	....
Clinton	4.64	3.67	2.49	2.87	1.19	3.65	3.23	8.73	3.72	0.59	5.18	1.04	41.00
Columbia (1)	5.18	5.75	2.44	1.51	0.95	4.02	9.26	8.30	2.41	3.62	3.57	0.75	47.76
Columbia (2)	5.74	6.58	3.20	1.78	1.22	....	....	....	....	3.70	3.83	1.02	....
Conway	5.67	[5.30]	4.16	2.07	1.59	3.57	10.31	4.45	5.55	1.69	3.01	0.00	[47.37]
Evergreen	6.23	6.56	....	3.40	2.57	5.53	6.27	6.11	....	....	....	0.67	....
Florence	....	....	....	....	5.64	4.31	5.89	11.89	1.46	2.46	4.11	1.20	....
Greenville	....	....	....	....	3.65	4.05	7.99	6.36	5.56	1.08	6.88	0.71	....
Greenwood	....	....	....	....	0.96	4.38	6.81	5.10	3.01	0.70	3.56	1.00	....
Hardeeville	....	....	....	....	0.63	6.12	9.83	6.42	6.87	0.99	2.56	0.00	....
Jacksonborough	....	....	....	....	0.00	4.46	5.89	9.83	2.86	0.27	6.07	....	....
Kingstree	....	....	....	....	1.45	4.64	6.82	6.16	3.51	1.83	4.00	....	....
Kirkwood	5.03	3.93	3.20	0.54	1.92	5.15	9.95	7.54	4.03	3.91	3.49	0.88	49.57
Newberry	6.92	[5.60]	3.12	2.06	1.17	6.06	6.23	5.36	2.66	0.93	5.00	0.69	[45.80]
Port Royal	....	....	....	....	....	....	4.72	4.63	2.00	0.10	5.44	0.00	....
St. George's	....	....	....	....	1.05	5.35	6.83	4.66	3.83	0.20	4.00	....	....

St. Matthew's	....	....	....	....	*3.94*	*6.07*	*9.38*	*3.37*	*2.59*	*0.44*	*2.98*	....	....
Simpsonville	....	....	....	....	....	....	*5.09*	....	*4.10*	*0.59*	*2.68*	*0.32*	....
Spartanburg	....	....	....	....	5.32	6.44	3.47	6.11	3.66	0.18	5.88	....	....
Statesburgh	4.91	5.47	3.27	1.09	3.30	5.10	6.27	7.05	3.23	2.81	2.80	0.75	46.05
Timmonsville	3.86	7.33	5.42	1.13	2.87	5.74	2.70	6.68	2.07	1.77	2.93	0.90	43.40
Trial	7.18	5.33	5.33	3.37	1.60	5.23	5.54	8.73	3.28	0.39	4.90	0.25	51.13
Walhalla	....	....	....	....	....	....	8.20	....	7.37	0.32	5.33	0.78	....
Winnsborough	4.14	5.93	2.67	1.52	2.21	7.84	6.16	8.60	2.78	1.99	5.81	0.00	49.65
Yorkville	6.58	5.19	1.64	1.75	2.30	6.46	7.29	1.73	3.31	2.24	4.76	0.58	43.83
South Dakota:													
Alexandria	....	....	....	....	1.40	1.52	2.15	3.81	6.25	....	....	0.80	....
Armour	....	....	....	....	4.32	3.10	7.03	1.80	....	....	....	....	....
Brookings	1.05	1.20	0.16	1.02	1.50	1.48	2.92	0.72	2.70	T.	[0.15]	0.94	[13.84]
Canton	....	....	....	....	....	....	1.40	3.09	4.53	....	1.08	1.88	....
Clark	....	....	....	....	....	....	3.69	T.	5.29	0.40	T.	0.19	....
De Smet	[0.70]	0.50	0.04	2.36	2.59	1.20	4.80	0.38	2.74	0.10	0.01	1.80	[17.22]
Fort Bennett	[0.60]	0.43	0.69	2.66	3.50	1.56	5.85	0.68	1.16	0.04	1.40	1.50	[20.07]
Fort Meade	0.27	0.85	0.12	2.64	2.02	1.60	6.38	0.00	0.67	1.71	0.88	0.86	18.00
Fort Randall	0.75	0.40	0.25	1.95	1.97	1.43	5.49	1.54	3.09	0.60	1.10	0.45	19.02
Fort Sisseton	9.80	4.70	3.30	4.63	....	....	....	....	....	....	....	....	....
Fort Sully (1)	0.67	3.42	0.60	3.03	3.22	1.54	4.18	1.00	1.19	0.06	0.19	0.35	16.45
Fort Sully (2)	0.70	0.46	0.59	2.86	2.96	1.64	3.35	1.01	1.09	0.08	0.19	0.36	15.29
Garden City	0.62	0.53	0.20	1.53	3.01	....	....	....	....	....	....	....	....
Huron	1.26	0.93	0.19	3.41	3.04	1.04	3.51	0.66	3.89	0.55	0.16	1.53	20.17
Kimball	1.10	1.00	0.12	2.40	1.56	0.72	3.93	1.76	3.43	0.50	0.47	0.75	17.74
Onida	....	....	....	2.27	2.27	1.52	2.14	....	0.37	....	....	....	....
Parkston	1.02	0.75	0.11	[2.50]	[3.80]	2.64	3.86	2.67	6.54	0.70	0.76	1.25	[26.65]
Rapid City	0.52	1.39	0.56	4.22	2.19	2.97	4.52	0.11	0.37	0.43	0.32	0.33	17.93
Roscoe	....	....	....	....	0.45	0.80	3.15	0.51	1.76	....	....	....	....
Spearfish	0.75	1.20	0.40	3.87	2.60	1.45	5.84	0.14	1.42	1.72	0.48	2.00	21.87
Spring Lake	0.75	0.78	0.50	8.40	5.40	4.00	8.75	2.00	....	....	....	....	....
Webster	3.34	3.94	1.94	2.03	4.01	7.07	7.07	0.42	4.84	0.63	0.20	2.53	38.02
Woolsey	1.85	0.90	T.	3.00	3.60	0.70	2.84	0.67	3.31	0.34	0.07	1.60	18.88
Woonsocket	0.80	0.90	0.12	2.58	1.92	1.57	3.91	0.62	2.81	0.40	T.	1.05	16.68
Yankton	0.96	0.20	0.27	1.46	1.72	2.68	4.54	2.68	2.31	0.48	1.04	1.37	19.71
Tennessee:													
Andersonville	[4.00]	4.90	2.18	2.16	6.71	7.47	6.34	4.91	8.58	1.22	5.98	1.19	[55.64]
Arlington	....	....	....	....	1.10	6.60	3.80	2.10	2.70	0.80	6.00	1.02	....
Ashwood	5.30	2.71	3.49	2.15	2.83	3.34	9.02	6.70	4.87	1.09	7.39	1.18	50.07
Austin	4.62	3.71	2.98	3.17	3.65	5.58	5.76	3.01	3.59	1.31	7.13	1.22	45.73
Bolivar (1)	....	....	....	....	....	8.40	3.50	2.55	7.10	T.	....	0.70	....

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Tennessee—Continued.													
Bolivar (2)	......	......	......	......	2.45	6.01	3.52	0.40	4.65	0.06	0.70	......	......
Brownsville	......	......	......	......	2.85	7.08	4.34	1.99	4.28	0.90	8.20	......	......
Carthage	4.46	2.71	3.16	3.30	3.52	5.64	6.91	0.08	1.73	1.78	8.04	1.18	42.51
Charleston	5.37	4.71	2.37	[2.30]	[4.10]	[5.60]	4.44	3.69	7.37	2.33	7.51	0.96	[50.75]
Chattanooga	5.31	5.10	3.71	3.21	4.59	4.16	3.33	3.77	7.87	1.38	6.44	0.44	49.31
Clarksville	2.90	1.31	2.28	1.84	4.67	3.34	3.01	1.20	5.29	1.67	7.22	1.03	35.76
Clinton	4.86	5.60	2.15	[2.60]	[4.80]	[6.00]	7.28	7.35	9.91	1.35	7.61	1.42	[60.93]
Cog Hill	[5.10]	3.50	2.57	3.30	3.77	2.35	[2.80]	3.50	5.70	0.09	2.91	[0.90]	[36.49]
Columbia	2.16	1.70	3.10	1.96	2.80	4.66	11.73	4.06	3.79	0.90	6.44	0.60	43.90
Covington (1)	......	......	......	......	1.43	7.80	4.78	2.40	4.50	0.95	6.15	......	......
Covington (2)	5.07	1.65	4.62	1.35	2.09	8.18	5.43	2.25	5.69	1.15	7.43	0.67	45.58
Cumberland Gap	......	......	......	3.00	6.17	5.41	7.24	......	......	......	......	1.92	......
Dunlap	......	......	......	2.78	3.23	6.53	6.47	2.32	8.69	1.92	7.22	......	......
Dyersburgh	......	......	......	......	2.36	8.16	5.92	1.42	6.64	0.94	8.71	......	......
Fayetteville	4.44	3.76	2.62	2.45	3.62	3.30	6.86	3.53	4.47	1.38	3.12	0.63	40.18
Florence Station	4.60	3.46	4.17	3.01	3.05	4.64	6.48	2.83	4.54	1.58	7.16	1.50	47.02
Fostoria	3.50	......	......	......	......	6.82	9.04	3.70	7.60	......	......	......	......
Grand Junction	......	......	......	......	2.53	9.07	6.33	1.22	6.90	0.75	6.74	0.36	......
Greeneville	3.40	2.43	2.18	1.88	3.41	6.29	5.45	2.66	2.06	1.50	3.32	1.52	36.10
Grief	......	......	......	......	......	*3.36	3.87	2.01	8.60	1.52	8.55	......	......
Hohenwald	4.22	2.67	3.74	2.15	4.37	6.69	8.53	5.65	6.25	1.14	8.68	1.09	55.18
Jacksboro	4.44	2.99	3.10	2.74	6.45	6.24	4.45	4.03	7.64	1.04	6.23	1.37	50.72
Johnsonville	3.02	2.05	2.44	3.19	1.46	3.51	3.55	3.03	8.34	0.63	8.12	0.05	39.39
Kingston (1)	5.29	6.23	2.98	[2.20]	[4.60]	[4.50]	3.16	3.15	9.63	1.19	7.64	1.69	[52.26]
Kingston (2)	......	......	......	......	6.89	6.14	2.96	......	9.63	......	......	......	......
Kingston Springs	3.95	2.20	2.50	2.05	6.89	6.22	4.29	1.37	8.22	1.18	6.65	1.15	46.67
Knoxville	3.88	5.82	2.08	1.92	4.08	5.57	2.85	6.42	5.74	1.81	6.58	0.98	47.73
Lawrenceburgh	5.69	4.09	3.79	2.47	1.72	4.33	......	......	4.85	......	......	......	......
Leeville	4.45	1.93	2.88	2.62	3.30	4.75	3.80	1.39	3.88	1.42	7.35	1.02	38.79
Lewisburgh	4.82	......	......	......	2.48	3.01	8.50	5.86	3.86	......	6.59	1.13	......
Lookout Mountain	4.28	3.28	3.25	1.98	4.32	4.20	3.01	4.22	5.58	1.56	[6.00]	[1.00]	[42.68]
Loudon	3.94	5.51	1.55	[2.10]	[3.60]	[4.20]	3.20	1.71	8.30	1.30	6.63	0.74	[42.78]
Lynnville	......	......	......	......	......	......	......	2.22	5.36	1.63	7.66	3.22	......
McKenzie	3.55	1.50	1.50	[1.20]	[3.40]	9.03	5.88	0.55	4.25	0.25	6.10	0.50	[37.71]

McMinnville	....	....	....	*2.86*	*2.86*	*4.62*	*5.23*	*3.74*	*4.49*	*1.86*	*4.09*	....	....
Memphis	5.28	1.90	5.33	3.47	1.48	7.39	4.77	5.62	3.01	0.75	5.21	0.46	44.67
Milan (1)	....	....	....	....	2.70	7.82	4.32	1.29	4.71	0.57	7.29	....	....
Milan (2)	4.82	1.31	4.41	1.11	2.47	8.81	4.00	1.43	4.85	0.81	8.14	0.71	42.87
Nashville	3.83	1.84	2.47	2.83	5.00	5.33	2.74	1.57	6.81	1.54	6.88	1.17	42.01
Nunnelly	3.51	2.74	3.64	2.18	5.81	5.31	7.98	3.91	7.64	1.15	7.68	0.92	52.47
Parksville	5.08	4.27	1.67	1.93	3.36	7.66	3.96	2.32	3.31	1.56	3.50	1.02	39.64
Riddleton	4.01	3.21	2.67	4.91	4.69	7.21	9.59	2.62	4.93	1.55	8.29	1.30	54.98
Rockwood	4.56	4.80	1.45	....	....	....	2.58	....	7.43	1.27	5.11	1.53	....
Rogersville	3.30	3.58	1.64	3.19	2.87	3.33	5.35	3.72	3.39	1.69	4.20	1.10	37.36
Rugby	....	....	....	....	....	6.30	6.27	5.12	6.43	0.91	5.45	1.41	....
Savannah	3.83	3.90	[3.40]	1.94	3.40	6.10	5.30	4.64	5.77	0.89	6.93	0.75	[46.85]
Spring Dale	3.89	2.90	2.03	2.24	[1.40]	3.29	6.77	3.22	6.47	1.45	6.00	1.70	[41.36]
Strawberry Plains	0.92	....	3.52	....	....	....	6.18	5.60	6.17	1.70	6.47	0.61	....
Trenton	5.25	1.74	3.32	1.51	3.74	[8.20]	2.69	1.02	6.43	1.15	9.83	0.93	[45.81]
Tullahoma	....	....	....	2.28	....	2.28	4.99	2.60	1.85	0.23	4.56	....	....
Watkins	3.72	1.63	2.38	2.21	4.71	4.94	1.66	0.98	4.58	0.43	6.75	1.32	35.31
Waynesborough	4.62	3.27	3.10	2.63	3.64	5.00	8.82	4.68	4.75	0.66	7.42	1.50	50.09
Woodstock	....	....	....	2.70	1.50	3.80	3.15	2.70	3.95	....	....	....	....
Texas:													
Abilene	2.74	2.62	1.07	0.71	2.93	6.36	1.80	0.21	3.03	1.22	2.54	T.	25.23
Austin	8.03	5.02	0.88	2.83	2.95	5.34	3.93	0.47	6.12	0.98	4.62	[0.05]	[41.22]
Baird	2.93	2.15	1.04	2.35	2.84	8.76	1.63	0.00	....	....	....	....	....
Bear Creek	2.87	1.57	1.40	1.25	2.38	7.33	4.33	0.02	5.92	0.50	3.87	T.	31.44
Belton	5.53	2.89	[2.00]	1.55	1.22	10.98	1.52	0.92	5.40	0.07	4.73	[0.00]	[36.81]
Brazoria	10.04	2.18	2.82	0.98	4.27	6.67	4.50	5.78	9.53	0.00	6.83	0.30	53.90
Brenham	8.56	2.55	3.92	2.93	2.29	5.26	2.49	1.34	5.83	0.21	4.99	0.72	41.09
Brownsville	2.72	3.27	3.61	2.69	1.26	4.43	0.50	7.03	7.44	0.20	1.44	0.02	34.61
Brownwood	3.09	3.04	1.39	2.61	2.35	8.90	3.76	0.21	5.20	0.19	3.95	0.01	34.70
Cedar Hill	9.20	....	1.76	4.50	4.00	6.00	9.00	....	....	....	....	....	....
Cleburne	5.46	4.45	3.05	1.88	3.06	7.39	11.50	0.25	1.87	0.00	1.87	....	....
Coldwater	....	....	....	....	....	....	4.70	1.15	0.50	4.00	....	....	....
College Station	7.07	2.29	2.39	2.74	2.42	9.01	2.47	1.19	14.86	0.11	6.06	0.07	50.68
Colorado	....	....	....	1.64	0.19	....	....	....	2.68	1.66	1.79	0.02	....
Columbia	7.33	0.83	3.71	0.90	3.85	7.12	3.46	3.28	7.23	0.00	4.92	T.	42.63
Corpus Christi	5.47	3.61	3.24	1.06	4.21	2.96	0.50	3.00	12.69	1.48	3.91	0.14	42.27
Corsicana (1)	8.73	4.35	3.38	5.60	2.75	5.45	2.68	0.65	7.62	0.02	8.66	0.08	49.97
Corsicana (2)	6.91	4.72	2.14	4.17	4.10	5.72	0.89	1.36	5.33	[0.20]	[5.80]	0.08	[41.42]
Cuero	....	....	....	....	3.70	3.62	0.30	1.32	6.99	0.00	4.60	....	....
Dallas	....	....	....	....	3.46	7.81	11.89	3.00	6.09	0.00	3.30	0.00	....

* Incomplete.

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Texas—Continued.													
Decatur	4.69	1.67	0.90	2.03	3.25	6.60	5.61	1.86	9.50	0.71	2.60	0.05	39.50
Durham	......	......	......	......	......	......	......	0.00	4.16	3.80	0.82	0.12	......
Duval	......	......	......	......	......	9.10	1.90	0.75	6.60	0.65	4.85	0.00	......
Eagle Pass, Camp	4.85	1.06	1.79	2.65	1.10	2.03	5.55	2.85	5.33	1.26	0.90	0.10	29.47
Edinburgh	4.14	1.52	2.27	3.64	2.82	3.67	0.61	5.25	4.50	0.05	1.23	0.15	29.85
El Paso	0.76	0.18	0.67	0.04	0.00	0.28	1.59	0.04	2.64	0.35	0.55	0.00	7.10
Forestburgh	[4.80]	1.62*	0.18	1.25	2.44	7.00	9.75	4.88	12.25	1.62	3.06	[0.02]	[48.87]
Fort Bliss	0.74	0.28	0.62	[0.04]	[0.03]	[0.30]	1.27	0.00	2.07	0.49	0.28	0.00	[6.12]
Fort Brown	1.91	2.51	3.61	2.68	1.26	4.40	0.90	8.45	7.44	0.20	0.60	0.00	33.96
Fort Clark	0.72	0.83	1.61	1.68	1.76	4.84	10.75	1.00	6.27	0.48	0.60	0.00	30.54
Fort Concho	1.94	2.57	1.15	2.03	2.28	......	......	......	......	......	......	......	......
Fort Davis	0.39	0.52	0.35	0.56	0.20	2.23	2.01	1.00	3.51	0.57	0.00	0.00	11.34
Fort Elliott	1.64	0.89	1.32	4.79	0.50	2.42	0.70	1.80	1.85	2.60	0.73	0.01	19.25
Fort Hancock	0.62	0.44	0.80	[0.10]	0.13	0.43	0.69	1.08	1.91	0.62	0.00	0.00	[6.82]
Fort McIntosh	1.98	2.20	2.30	2.46	0.97	1.85	4.21	0.08	7.36	2.10	0.50	0.00	26.01
Fort Ringgold	2.04	2.62	2.08	3.52	0.04	3.46	0.46	3.00	2.52	1.89	0.04	0.00	21.67
Fort Worth	5.03	2.92	2.81	3.52	4.91	3.46	14.01	0.72	3.72	1.95	4.56	0.00	47.61
Fredericksburgh	......	......	......	1.61	0.90	5.17	1.43	0.73	5.84	1.61	3.58	0.04	......
Gainesville	......	......	......	......	3.71	7.49	6.41	......	15.43	......	......	......	......
Gallinas Springs	4.94	4.33	3.20	1.63	0.23	3.11	2.39	1.86	5.75	0.79	3.34	0.10	31.67
Galveston	7.81	2.94	3.31	1.40	1.81	4.79	0.75	5.11	3.98	T.	5.39	0.23	37.52
Graham	......	......	......	......	1.21	7.44	3.64	0.82	10.74	0.85	2.53	0.02	......
Hartley	......	......	......	......	......	......	3.58	0.93	0.50	4.85	2.30	......	......
Hearne	......	......	......	......	2.25	7.66	2.90	1.50	6.15	0.00	6.40	0.00	......
Houston	9.45	3.32	[3.20]	2.46	3.72	10.67	1.83	1.53	6.33	0.03	2.94	0.43	[45.91]
Howe	......	......	3.95	2.55	4.07	4.84	3.84	2.63	10.05	1.28	3.29	0.01	......
Huntsville	7.49	2.14	3.41	[2.50]	2.30	7.64	2.32	1.96	2.67	0.02	6.49	0.40	[39.34]
La Grange	7.57	3.79	3.16	3.41	3.84	8.83	1.52	5.49	6.50	2.17	4.54	0.30	51.12
Lampasas	5.08	3.41	1.62	2.14	2.46	12.65	2.60	0.29	3.16	0.38	3.21	[0.00]	[37.00]
Longview	6.55	3.95	2.65	6.70	3.32	12.31	2.66	0.62	4.71	0.60	9.55	0.00	53.62
Luling	4.76	3.87	4.87	1.73	3.97	7.78	2.84	2.97	5.56	1.07	5.63	[0.20]	[45.25]
Menardville	......	......	......	......	1.52	6.95	6.48	0.18	4.54	......	1.75	0.00	......
Merkel	......	......	......	0.33	2.68	6.33	3.04	0.00	3.91	2.15	......	0.00	......
Mesquite	8.49	2.62	4.11	3.93	3.79	6.51	4.00	2.21	5.22	1.79	4.79	0.00	47.46

Miami	....	*1.02*	*1.32*	....	....	....	....	*1.10*	*0.50*	*0.25*	*0.76*	*0.00*	....
New Braunfels	*6.00*	*3.73*	*4.00*	*1.93*	*0.71*	*7.42*	*2.60*	*6.00*	*7.96*	*0.90*	*4.73*	T.	*45.98*
New Ulm	8.38	2.73	4.13	3.13	2.52	6.21	2.13	3.33	4.35	0.69	3.83	0.37	41.80
Palestine	6.82	4.02	4.53	2.31	3.47	7.00	2.21	1.77	4.73	1.21	7.97	0.39	46.43
Panhandle	....	....	....	....	....	....	....	1.32	0.45	1.82	1.28	0.00	....
Panter	4.61	3.53	1.76	2.39	2.64	8.09	4.90	0.10	6.17	1.11	[4.20]	T.	[39.50]
Paris	....	....	....	....	2.89	2.74	3.52	2.00	6.85	1.00	....	0.00	....
Pecos City	[0.40]	[0.35]	1.56	0.15	0.04	1.35	2.40	0.01	0.76	1.05	0.75	[0.00]	[8.82]
Peña Colorado, Camp	1.95	4.50	0.00	T.	0.25	6.04	2.63	1.24	3.45	0.93	0.60	0.00	21.59
Rio Grande City	1.40	2.67	2.16	4.38	0.16	3.03	0.62	3.41	2.25	1.52	0.85	0.19	22.64
Round Rock	....	....	....	....	....	....	....	....	6.60	0.30	6.50	0.00	....
San Antonio (1)	5.11	3.46	3.74	2.91	0.55	4.79	4.04	3.19	5.47	0.97	4.46	0.27	38.96
San Antonio (2)	4.96	3.70	3.56	2.87	0.00	3.77	3.47	3.32	4.45	0.09	4.05	0.30	34.54
Santa Maria	4.11	[2.20]	1.62	2.53	2.16	0.71	0.00	4.50	1.39	0.36	[1.00]	[0.20]	[20.78]
Silver Falls	1.25	0.60	0.00	1.25	0.82	3.47	1.39	0.00	1.50	2.98	1.11	0.00	14.37
Snyder	....	2.20	0.30	0.00	....	3.80	2.71	0.00	6.50	2.90	....	....	....
Temple	....	....	....	1.03	2.40	10.92	1.30	....	4.00	3.67	....	....	....
Tyler	13.85	[3.80]	[3.50]	[3.90]	4.25	10.27	3.64	0.10	4.85	1.50	10.49	0.00	[60.15]
Waco	9.50	3.00	2.20	2.00	2.10	8.80	3.20	0.00	4.95	0.00	4.30	0.00	40.05
Weatherford	....	....	....	....	3.52	8.02	6.51	0.01	6.02	....	....	....	....
Utah:													
Alta	....	....	....	....	....	....	....	1.25	0.00	0.60	0.00	....	....
Beaver	....	....	....	....	1.20	0.86	0.38	1.93	0.40	1.62	0.14	3.79	....
Bingham	....	....	....	....	....	....	....	0.00	0.25	2.43	0.15	1.80	....
Blue Creek	0.25	0.00	1.15	0.50	1.35	0.00	0.00	0.60	0.35	1.85	0.60	2.40	9.05
Corinne	0.65	0.05	1.70	1.25	1.30	0.00	0.00	0.45	0.40	3.25	0.98	4.53	14.56
Fort Douglas	0.82	0.91	1.38	2.57	2.41	T.	T.	0.87	0.52	3.81	1.00	4.37	18.66
Fort Duchesne (1)	0.39	0.18	0.32	0.68	0.73	0.15	0.69	0.53	0.36	0.75	0.08	2.01	6.87
Fort Duchesne (2)	0.35	0.18	0.32	0.68	0.73	0.15	0.49	0.56	0.34	0.66	0.05	1.77	6.28
Kelton	0.22	0.00	1.26	0.92	1.23	0.20	0.00	0.00	0.00	0.57	0.11	2.72	7.23
Levan	....	....	....	....	T.	0.90	0.00	1.18	0.92	2.48	1.34	4.20	....
Loseo	....	....	....	....	0.35	0.15	5.25	2.42	0.40	1.10	T.	8.50	....
Moab	....	....	....	....	....	....	....	0.45	0.02	0.80	0.33	2.83	....
Mount Carmel	....	....	....	....	....	....	....	1.86	0.34	2.41	0.78	6.94	....
Mount Pleasant	....	....	....	....	....	....	0.81	0.55	0.55	1.35	0.76	3.55	....
Nephi	....	....	....	....	0.50	0.09	0.76	1.96	0.40	1.72	0.28	2.35	....
Ogden (1)	0.55	0.40	1.15	1.57	1.95	0.05	0.00	1.03	0.65	3.81	0.79	4.96	16.91
Ogden (2)	....	....	....	....	....	....	....	1.50	0.56	T.	0.70	3.79	....
Park City	....	....	....	....	....	....	....	0.00	0.00	0.66	0.00	3.00	....
Price	0.30	0.40	0.60	0.30	0.85	0.00	1.00	0.00	0.80	0.80	0.00	0.40	5.45

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Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Utah—Continued.													
Promontory	0.45	0.11	0.04	0.04	1.05	0.00	0.00	1.00	0.44	0.10	0.17	0.93	4.33
Provo	......	......	......	......	......	......	......	0.00	0.50	1.12	1.15	2.88	......
Richfield	......	......	......	......	......	......	......	1.75	......	0.47	0.23	1.78	......
St. George	......	......	......	......	......	0.05	0.33	0.00	1.26	0.82	0.00	4.10	......
Salt Lake City	0.73	0.81	1.64	1.52	2.97	0.01	0.08	0.92	0.52	3.85	1.04	4.37	18.46
Stockton	......	......	......	......	......	......	......	0.00	0.13	2.14	0.36	1.24	......
Taylor's Ranch	2.22	1.38	......	......	......	......	0.96	0.93	0.56	0.91	0.35	3.03	......
Terrace	0.05	0.00	1.45	1.00	1.00	0.50	0.00	0.00	0.00	0.75	0.00	1.80	6.55
Vermont:													
Brattleboro	5.30	1.72	1.24	2.39	2.26	4.01	8.20	4.04	3.87	4.44	7.29	4.19	48.95
Burlington	3.57	1.59	2.35	1.51	4.28	6.26	4.09	2.48	4.82	3.32	2.46	1.48	38.21
Chelsea	4.11	2.35	3.52	1.28	4.74	6.59	5.05	1.85	4.95	3.57	4.81	3.52	46.34
Cornwall	3.59	1.20	3.52	1.08	3.97	5.07	5.60	1.41	3.50	3.36	3.88	2.30	38.48
Coventry	3.05	2.40	4.00	2.90	4.35	12.35	......	......	......	......	......	......	......
East Berkshire	3.45	1.40	3.53	1.59	3.56	7.40	3.62	3.29	6.30	4.25	3.54	3.61	45.54
Hartland	......	......	......	......	......	......	......	......	3.79	4.75	4.93	3.79	......
Jacksonville	5.96	2.37	2.02	3.72	4.82	5.15	9.70	4.04	3.05	4.31	7.55	4.84	57.53
Lunenburgh	3.53	1.84	4.30	1.00	3.02	5.43	5.37	1.74	5.17	3.58	3.61	1.48	40.07
Manchester	4.23	[1.80]	[1.90]	[1.50]	3.51	8.42	8.38	4.31	5.77	3.95	5.34	5.60	[54.71]
Northfield	3.90	2.18	2.05	1.10	2.48	5.02	4.65	1.59	4.06	3.57	3.45	2.61	36.66
St. Johnsbury	[3.30]	0.65	0.70	[1.10]	2.40	6.40	4.48	1.48	5.77	3.57	3.50	0.70	[34.05]
Saxton's River	4.42	1.99	1.66	1.43	3.65	......	......	......	......	4.31	5.70	......	......
Strafford	4.80	3.25	4.30	1.40	3.60	5.20	6.50	2.00	5.00	2.90	5.50	3.00	75.45
Vernon	4.97	1.90	1.73	1.89	3.91	3.84	11.02	2.16	5.58	4.64	6.40	4.55	52.59
Virginia:													
Abingdon	2.96	4.24	1.26	2.12	5.19	6.60	8.72	3.62	3.18	1.69	3.24	1.56	44.38
Alum Springs	......	......	......	3.54	9.73	3.57	8.09	......	......	......	......	......	......
Birdsnest	5.85	5.80	7.20	11.25	3.75	5.25	8.40	4.05	6.70	7.50	5.05	0.55	71.35
Bolar	[4.30]	[2.60]	2.50	3.05	10.10	3.90	5.50	0.80	8.60	4.05	4.90	0.00	[50.30]
Cape Henry	5.81	4.12	4.96	9.78	4.54	6.89	7.21	4.19	3.96	7.60	3.24	0.27	62.57
Christainsburgh	4.11	2.60	1.74	2.34	4.46	3.97	4.88	3.55	4.01	2.27	2.61	0.78	37.32
Dale Enterprise	4.04	1.84	2.08	3.83	11.70	3.20	6.66	2.80	6.70	4.28	5.18	0.23	52.54
Fort Monroe	4.26	5.47	5.69	9.83	3.79	4.34	11.61	7.16	4.40	7.72	3.57	0.54	68.38
Fort Myer	1.77	0.49	4.80	10.14	11.51	4.45	8.23	4.28	3.47	4.32	5.85	0.23	59.59

Lexington	....	....	....	....	....	*3.98*	*8.75*	*4.88*	*4.88*	*4.75*	*6.55*	*0.03*	....
Lynchburgh	*5.26*	*3.06*	*2.44*	*3.14*	*7.14*	*3.82*	*10.94*	*3.82*	*10.69*	*4.90*	*4.86*	*0.51*	*60.58*
Marion	2.55	3.46	1.52	2.18	8.24	7.38	7.65	3.91	3.50	3.50	3.47	1.61	48.97
Middletown	....	....	....	....	....	....	....	....	1.92	4.34	9.14	0.36	....
Mossing Ford	....	....	....	....	....	....	11.74	4.18	5.50	4.76	3.64	0.57	....
Norfolk	4.88	4.21	7.52	11.87	4.58	4.75	10.69	5.93	5.41	7.56	2.55	0.77	70.72
Nottaway C. H	....	....	....	....	....	....	....	2.52	5.47	4.66	3.98	0.61	....
Petersburgh	3.71	5.45	5.29	6.22	8.83	7.94	4.46	2.38	6.74	5.43	4.21	0.67	61.33
Richmond	....	....	....	....	....	....	....	....	5.60	5.23	4.59	0.57	....
Smithfield	3.77	3.89	8.13	13.29	6.64	5.24	8.55	6.16	4.29	8.17	3.37	0.75	72.25
Spottsville	3.66	4.45	5.62	11.40	5.45	8.82	7.05	6.00	5.50	7.25	5.80	0.85	71.85
University of Virginia	4.42	2.65	1.92	4.90	9.22	4.72	12.05	3.16	9.60	4.50	4.52	0.00	61.66
Woodstock	....	....	....	....	....	....	....	....	3.07	4.07	4.29	0.46	....
Wytheville	3.05	3.30	1.37	....	5.00	8.08	6.69	5.59	3.35	....	....	....	....
Washington:													
Blakeley	2.57	1.05	4.08	1.90	2.32	0.89	0.26	1.82	5.24	2.94	2.66	4.06	29.79
Fort Canby (1)	9.36	2.53	4.84	4.01	3.30	1.36	0.24	2.92	4.78	8.08	4.16	7.86	53.44
Fort Canby (2)	....	....	....	....	....	....	....	3.48	5.33	4.46	5.87	7.94	....
Fort Spokane	1.90	0.20	1.96	0.42	1.20	0.23	0.10	0.25	0.27	2.00	0.00	4.40	12.93
Fort Townsend	1.02	0.54	1.42	1.33	2.45	0.29	0.01	1.34	0.75	2.18	1.55	2.07	15.00
Fort Vancouver	3.89	1.14	2.28	3.13	3.97	0.35	0.00	1.12	1.60	4.28	3.20	4.56	29.52
Fort Walla Walla	0.04	0.75	1.06	1.32	3.25	2.53	T.	0.05	0.26	0.70	1.10	2.67	13.73
Olympia	4.05	1.40	3.91	1.89	2.42	1.32	0.02	1.99	3.52	4.30	4.79	4.14	33.75
Port Angeles	2.96	0.99	2.43	2.49	1.53	0.94	0.00	1.58	2.35	3.33	3.20	5.78	27.58
Spokane Falls	1.85	0.34	1.93	0.55	1.70	0.39	0.46	0.22	0.37	2.01	0.42	4.03	14.27
Tatoosh Island	8.49	6.96	*6.18	*2.46	3.37	1.84	0.01	5.74	5.26	7.13	8.65	11.86	67.95
Vashon Island	0.90	1.33	3.69	2.63	2.25	0.95	T.	1.79	3.11	1.29	1.61	2.83	22.43
Walla Walla	0.47	0.79	1.39	1.51	4.01	1.33	T.	0.06	0.33	0.88	0.81	2.92	14.53
West Virginia:													
Buckhannon	3.10	3.46	2.19	5.30	6.01	5.76	8.31	2.33	3.52	4.54	7.24	2.78	54.54
Charleston	3.53	2.13	1.97	2.23	6.49	7.19	6.32	1.83	5.69	3.39	5.69	1.78	48.29
Clarksburgh	2.70	3.28	1.51	....	....	....	....	1.50	3.24	....	....	....	....
Ella	....	....	....	....	....	....	....	....	0.69	2.31	5.96	2.67	....
Glenville	3.42	2.68	1.49	4.12	5.13	4.51	9.61	1.89	4.89	3.08	7.19	2.45	50.46
Harper's Ferry	....	....	....	....	....	....	3.27	1.36	5.94	3.87	5.29	0.35	....
Hinton	2.07	1.19	1.04	1.91	5.70	3.50	[4.50]	3.25	4.18	1.31	2.17	*0.04	[30.89]
Morgantown	2.75	2.68	3.09	4.97	6.37	4.47	5.12	1.61	3.91	3.34	7.87	2.85	49.03
Parkersburgh (1)	2.60	2.67	1.62	2.37	2.97	4.03	7.66	1.54	3.12	1.87	4.96	1.89	37.30
Parkersburgh (2)	3.03	2.88	1.66	2.72	2.80	4.03	7.66	1.54	3.12	1.87	4.96	1.89	38.16
Point Pleasant	....	....	....	....	....	....	....	0.20	2.71	3.15	4.94	1.70	....

* Incomplete.

MONTHLY AND ANNUAL PRECIPITATION (IN INCHES AND HUNDREDTHS) FOR 1889, ETC.—Continued.

Stations.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
West Virginia—Continued.													
Rivesville	......	......	......	......	5.47	8.45	4.50	1.68	......	......	......	......	......
Rowlesburgh (1)	2.71	1.56	0.95	3.23	2.05	5.30	5.17	1.67	2.86	2.36	4.83	3.05	35.74
Rowlesburgh (2)	......	......	......	......	......	9.05	5.10	0.90	2.70	2.90	3.50	3.00	......
Tyler's Creek	[3.10]	0.50	1.80	0.25	[4.20]	6.45	13.30	1.14	3.32	2.84	3.81	3.03	[43.74]
Weston	2.99	2.31	1.54	4.99	1.77	3.96	6.10	1.31	4.16	3.54	9.71	2.10	44.48
Wheeling	2.87	1.74	1.31	2.37	3.34	3.71	2.05	1.88	2.65	2.02	4.70	2.87	31.51
White Sulphur Springs	3.03	2.55	1.57	2.63	6.81	4.32	......	......	5.15	......	......	0.98	......
Wisconsin:													
Chippewa Falls	1.41	1.29	0.38	0.96	2.41	2.94	3.66	2.92	1.95	0.05	1.49	2.06	21.52
Delavan	2.07	2.23	1.36	2.53	5.25	3.21	[4.00]	[0.70]	[3.20]	0.14	1.69	2.09	[28.47]
Embarrass	3.50	3.45	0.90	1.20	4.20	3.50	4.70	3.00	2.75	0.40	2.35	3.80	33.75
Fond du Lac	2.24	2.67	0.47	1.02	4.29	4.18	2.32	1.60	4.79	0.12	2.07	2.33	28.10
Friendship	......	......	......	1.38	6.38	1.50	2.72	3.31	2.62	T.	......	......	......
Glasgow	[1.00]	2.95	0.57	1.27	4.70	3.65	1.30	6.49	2.83	[0.05]	[1.10]	1.76	[27.67]
Grantsburgh	[1.20]	[1.10]	[0.90]	2.55	3.84	1.96	4.00	14.89	4.01	T.	0.55	1.95	[36.95]
Green Bay	3.75	3.32	0.74	1.09	4.75	3.06	2.55	1.36	4.68	0.26	3.62	3.38	32.56
Greenwood	......	......	......	......	3.76	3.69	3.91	4.83	3.01	0.00	2.46	2.85	......
Hayward	......	......	†0.80	0.54	2.50	2.15	1.29	5.02	2.20	0.36	......	......	......
La Crosse	1.45	0.93	0.76	1.51	2.30	3.31	2.72	4.64	2.76	0.06	1.98	1.95	24.37
Lincoln	[2.00]	[1.90]	0.34	0.70	8.05	4.00	1.30	1.85	3.25	1.16	[2.10]	2.61	[29.26]
Madison	1.59	1.84	1.48	1.71	3.28	2.00	2.12	0.72	1.93	T.	1.17	2.33	20.17
Manitowoc	2.68	2.56	0.53	1.06	4.09	4.28	2.24	2.46	2.51	0.28	2.77	3.06	28.52
Medford	......	......	......	......	......	n1.90	3.40	2.83	2.78	0.05	1.70	2.18	......
Milwaukee	1.95	2.00	1.07	2.40	5.61	5.21	3.08	0.76	3.45	0.56	2.71	2.87	31.70
Oshkosh	2.89	3.18	0.68	0.72	3.52	3.49	......	......	......	......	0.31	2.83	......
Phillips	1.73	0.88	0.93	0.50	4.05	2.30	4.02	3.90	1.33	0.35	1.75	1.63	23.37
Portage	1.72	1.74	1.19	2.20	3.06	3.78	3.42	1.47	1.18	0.16	2.36	2.61	24.89
Richland Centre	[1.50]	[0.90]	0.63	2.37	4.55	3.11	2.53	0.49	2.57	T.	1.90	2.20	[22.75]
Summit Lake	......	......	......	10.38	......	......	4.45	3.60	3.40	1.00	3.00	2.40	......
Viroqua	[0.90]	[0.60]	[1.10]	1.60	3.03	1.90	2.16	2.36	4.79	T.	0.16	0.05	[18.65]
Waucousta	......	1.20	0.35	......	......	......	......	T.	T.	T.	0.65	......	......
Wausau	......	......	......	......	......	6.28	3.75	3.40	0.57	0.06	0.67	0.85	......
Weston	2.62	1.34	1.04	2.63	4.02	9.76	3.75	7.55	......	......	......	......	......

Wyoming:													
Bordeaux	....	....	....	....	....	....	*1.70*	*0.65*	*0.29*	*0.95*	*0.45*	....	....
Camp Pilot Butte	*0.16*	*0.10*	*0.16*	0.59	0.62	0.11	0.00	0.29	0.05	0.52	0.80	0.91	4.31
Carter	0.80	0.40	[1.30]	[1.20]	1.00	0.60	0.10	1.10	0.40	1.30	0.25	1.20	[9.65]
Cheyenne	0.23	0.62	0.26	1.24	2.85	3.67	1.23	0.71	0.54	2.58	0.56	0.16	14.65
Fort Bridger	1.53	0.50	0.00	2.00	2.19	0.62	0.21	1.37	0.28	1.12	0.59	1.28	11.69
Fort D. A. Russell	[0.60]	0.20	T.	3.22	2.05	4.12	1.82	1.69	0.17	4.80	0.10	0.30	[19.07]
Fort Laramie	0.15	0.50	T.	1.13	2.35	1.62	2.00	0.90	0.00	1.48	0.70	0.00	10.83
Fort McKinney (1)	0.41	0.81	0.13	0.41	0.79	1.49	0.59	0.14	0.17	0.89	[0.90]	[0.10]	[6.83]
Fort McKinney (2)	0.30	0.48	0.07	0.43	0.45	1.64	0.59	0.15	0.07	0.86	0.23	0.00	5.27
Fort Sheridan	1.05	1.93	0.53	0.92	1.40	0.66	0.56	0.64	0.59	1.32	2.14	8.89	20.63
Fort Washakie (1)	0.76	0.25	0.06	1.46	0.67	2.98	0.29	0.46	0.14	0.77	0.32	0.24	8.40
Fort Washakie (2)	0.75	0.25	0.06	1.53	0.55	2.60	0.31	0.31	0.14	0.87	0.71	0.62	8.70
Lusk	[0.60]	0.76	0.05	1.99	1.28	1.39	2.40	0.16	0.02	0.57	0.34	0.09	[9.65]
Wheatland	....	....	....	....	3.45	3.37	1.99	0.75	0.21	0.32	....	....	....

APPENDIX 13—Continued.

NUMBER OF TIMES EXCESSIVE PRECIPITATION WAS RECORDED DURING THE YEAR 1889.

[It is impracticable on account of the space required to publish the full record showing the amount and rate of fall in each case.]

States.	Jan.		Feb.		Mar.		Apr.		May.		June.		July.		Aug.		Sept.		Oct.		Nov.		Dec.	
	2.50 inches in 24 hours.	1.00 inch per hour.	2.50 inches in 24 hours.	1.00 inch per hour.	2.50 inches in 24 hours.	1.00 inch per hour.	2.50 inches in 24 hours.	1.00 inch per hour.	2.50 inches in 24 hours.	1.00 inch per hour.	2.50 inches in 24 hours.	1.00 inch per hour.	2.50 inches in 24 hours.	1.00 inch per hour.	2.50 inches in 24 hours.	1.00 inch per hour.	2.50 inches in 24 hours.	1.00 inch per hour.	2.50 inches in 24 hours.	1.00 inch per hour.	2.50 inches in 24 hours.	1.00 inch per hour.	2.50 inches in 24 hours.	1.00 inch per hour.
Alabama	2	...	3	...	...	...	2	...	...	...	1	1	5	4	1	2	14	1	...	...	3	...	1	...
Arkansas	5	...	...	...	...	...	1	...	...	...	3	1	3	2	4	...	2	...	...	1	6	...	...	...
Arizona	...	...	...	...	...	...	...	...	...	...	...	...	3	2	...	...	1	2	...	...	...	...	1	...
California	...	...	...	...	6	1	...	...	2	...	...	...	...	...	...	...	...	...	11	1	4	...	13	1
Connecticut	...	...	...	...	...	...	...	...	...	...	...	...	4	2	1	...	1	...	2	...	5	...	...	...
Colorado	...	...	...	...	...	...	...	...	...	1	...	...	1	1	...	1	...	...	...	...	...	...	...	...
Dakota	...	...	...	...	...	...	...	1	...	1	2	4	3	7	1	1	4	...	...	...	...	...	...	...
District of Columbia	...	...	...	...	...	...	3	...	1	...	...	...	2	...	...	1	...	...	...	...	...	...	...	...
Delaware	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Florida	3	1	...	...	3	...	3	...	1	1	12	1	4	1	5	2	10	2	...	1	3	1	...	...
Georgia	2	...	5	2	1	...	1	1	2	...	5	3	10	7	5	5	10	3	...	...	1	...	...	...
Indiana	1	...	...	...	...	...	...	...	12	1	6	...	6	2	1	...	6	...	...	...	3	...	2	...
Illinois	...	...	...	...	...	...	1	...	5	1	4	2	3	5	1	...	5	...	2	...	1	...	...	1
Iowa	...	...	...	...	...	...	...	...	6	1	8	2	10	6	1	1	2	...	...	...	...	...	...	...
Indian Territory	...	...	...	...	...	...	...	...	1	2	1	...	...	...	2	...	3	...	...	...	...	...	...	...
Kansas	...	...	...	...	...	...	5	1	35	5	14	1	28	10	18	10	7	...	...	...	2	...	...	...
Kentucky	...	...	...	...	...	...	...	...	4	...	...	4	2	3	...	...	4	...	...	...	1	...	...	...
Louisiana	1	...	...	...	2	...	4	...	...	...	17	1	6	7	3	1	2	2	...	...	5	...	...	...
Mississippi	1	...	...	...	...	...	...	...	...	...	14	1	1	...	3	2	3	2	...	...	...	...	...	...
Minnesota	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	...	2	...	...	...	...	...	...	...

Massachusetts	*1*	....	....	....	....	....	....	....	*1*	....	*2*	*1*	*4*	*1*	*4*	*1*	....	....	....	....	*11*	....	....	....
Missouri	....	....	....	....	*2*	....	....	....	*10*	....	*4*	*1*	*1*	*2*	*1*	....	*7*	*2*	*3*	*1*	*1*	....	....	....
Maryland	....	....	....	....	2	....	5	....	5	3	....	....	7	1	1	1	....	....	....	....	....	....	....	....
Maine	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3	....	....	....
New York	1	....	....	....	1	....	4	....	6	....	6	....	9	3	1	1	6	1	1	....	18	....	....	....
North Carolina	1	....	1	1	....	....	3	....	9	1	7	2	8	2	4	....	3	1	....	....	3	....	....	....
New Hampshire	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	1	....	....	....
New Mexico	....	....	....	....	....	....	....	....	....	....	1	1	....	1	....	....	....	....	....	....	....	....	....	....
Nebraska	....	....	....	....	....	....	....	....	1	1	1	....	6	4	4	1	1	1	....	....	....	....	....	....
New Jersey	4	....	....	....	....	....	14	....	1	....	1	....	17	2	5	....	10	....	1	....	11	....	....	....
Ohio	....		....	....	....	....	....	....	5	1	2	3	5	....	1	3	1	....	....	....	....	....	....	....
Oregon	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	1	....	....	....	....	....
Pennsylvania	1	....	2	....	....	....	12	....	24	1	7	....	18	5	11	1	8	1	3	....	11	....	....	....
Rhode Island	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
South Carolina	1	....	10	1	2	....	3	1	11	....	3	2	13	3	5	2	26	....	....	....	9	....	....	....
Texas	6	....	5	1	2	1	8	2	6	2	18	4	12	1	2	2	25	5	....	....	4	....	....	....
Utah	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	1	....	....
Virginia	1	....	....	....	2	....	9	....	8	2	2	....	6	1	1	1	5	....	5	....	....	....	....	....
Vermont	....	....	....	....	....	....	....	....	1	....	2	....	2	....	....	....	....	....	....	....	1	....	....	....
Wisconsin	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1	3	2	1	....	....	....	....	....	....
Washington	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....
Wyoming	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....
West Virginia	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....

APPENDIX 14.

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE DAY, SEVENTY-FIFTH
FOR THE YEARS 1883 TO 1889, INCLUSIVE,

ABILENE, TEX.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1886 to 1889.										
Jan	11.7	11.3	12.9	11.1	11.0	10.8	10.5	10.3	10.5	10.6
Feb	11.0	10.6	10.5	9.9	9.5	9.3	9.8	9.6	8.7	9.5
Mar	12.4	12.2	12.6	12.0	11.7	11.6	11.2	11.4	11.4	13.0
Apr	12.2	12.1	12.1	11.6	10.8	10.3	10.0	9.4	10.7	12.7
May	11.1	11.1	11.0	10.6	10.3	9.7	9.5	9.6	11.7	13.7
June	9.9	9.4	9.0	8.8	8.6	8.4	7.5	7.9	9.3	10.9
July	8.4	8.1	8.0	7.7	7.6	7.1	6.8	7.0	8.6	10.3
Aug	9.3	8.9	8.6	8.1	8.0	7.7	7.5	7.2	8.6	10.7
Sept	7.5	7.5	7.2	7.0	6.7	6.6	6.8	6.7	6.9	8.8
Oct*	9.7	9.4	9.3	8.8	8.7	8.5	8.3	8.1	8.1	9.8
Nov*	9.9	9.8	9.5	9.0	8.6	8.5	8.1	8.3	8.2	8.8
Dec*	10.3	10.2	10.0	9.8	9.7	9.8	9.4	9.3	9.5	9.8
Means	10.38	10.05	10.06	9.53	9.27	9.02	8.78	8.73	9.35	10.72

ALBANY, N. Y.

1883 to 1889.										
Jan	5.7	5.3	5.4	5.5	5.4	5.2	5.7	5.9	6.5	7.3
Feb	5.8	5.7	5.7	5.7	5.7	5.5	5.3	6.2	6.8	7.8
Mar	5.8	5.8	5.6	5.7	5.5	5.6	6.0	6.8	8.2	9.3
Apr	5.0	5.0	4.7	4.5	4.6	4.7	5.4	6.4	7.3	7.7
May	4.3	4.0	3.8	3.9	3.8	3.9	4.5	5.8	6.8	7.2
June	4.3	3.9	3.9	4.2	3.8	3.8	4.8	5.8	6.3	6.8
July	3.9	3.6	3.5	3.3	3.4	3.6	4.2	5.2	5.9	6.6
Aug	3.6	3.3	3.4	3.4	3.3	3.2	3.8	4.6	5.3	5.7
Sept	3.7	3.4	3.4	3.5	3.4	3.4	3.8	4.6	5.8	6.5
Oct	5.0	4.9	4.8	4.6	4.7	4.6	4.7	5.4	6.6	7.4
Nov	5.9	5.9	5.8	5.8	5.8	5.7	5.9	6.3	7.3	8.0
Dec	6.7	6.6	6.6	6.7	6.4	6.1	6.4	6.4	6.9	7.7
Means	4.98	4.78	4.72	4.73	4.65	4.61	5.04	5.78	6.64	7.33

* Five years' record.

APPENDIX 14.

MERIDIAN TIME, COMPUTED FROM SELF-REGISTERING ANEMOMETER RECORDS, EXCEPT WHEN OTHERWISE STATED.

ABILENE, TEX.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
11.5	13.0	14.7	14.6	14.7	14.5	14.5	13.5	11.9	10.1	10.4	10.6	11.4	11.5	11.9
11.4	12.4	13.7	13.8	14.0	13.9	13.7	13.3	12.6	11.0	10.4	10.9	11.4	11.7	11.4
14.6	14.9	15.3	15.2	15.0	15.1	14.9	14.8	14.5	12.6	10.9	11.2	11.8	12.1	13.0
13.8	13.8	14.2	14.4	14.7	14.8	14.8	14.6	14.8	14.0	12.1	11.9	11.8	11.8	12.6
14.1	14.0	13.9	13.5	13.6	13.9	14.4	14.6	14.6	13.4	11.7	10.9	11.3	11.2	12.2
11.5	11.2	11.5	11.4	11.5	12.2	12.5	12.9	13.0	13.4	11.9	10.8	10.0	10.1	10.6
10.2	9.8	9.4	9.1	9.4	9.6	10.2	10.7	11.0	10.9	9.7	8.3	8.3	8.1	8.9
10.8	10.4	10.0	9.8	10.8	10.9	11.1	11.5	12.6	12.3	10.7	9.6	9.7	9.4	9.8
10.5	10.5	10.9	10.8	10.9	11.3	11.6	11.5	11.7	9.8	8.3	8.5	8.4	7.9	8.9
11.8	12.5	12.7	12.5	12.8	12.7	12.9	12.7	11.7	9.5	8.9	9.2	10.0	9.9	10.4
10.7	11.8	11.8	11.7	12.1	11.7	11.7	10.9	9.2	8.5	8.5	8.8	9.3	9.2	9.8
11.3	12.5	13.3	13.5	13.8	14.0	13.4	12.5	10.4	9.4	10.0	10.1	10.0	10.2	10.9
11.85	12.23	12.62	12.52	12.78	12.88	12.98	12.79	12.33	11.24	10.29	10.07	10.28	10.26	10.86

ALBANY, N. Y.

7.8	8.5	8.8	8.6	8.7	8.1	7.3	6.8	6.4	6.4	6.4	6.1	6.0	5.9	6.7
8.4	8.8	9.4	9.6	9.3	9.2	8.4	7.9	7.0	6 9	6.6	6.6	6.2	6.4	7.1
9.8	10.2	10.3	10.4	10.7	10.7	10.2	9.7	8.2	7.8	7.2	7.2	6.5	6.4	7.8
8.1	8.2	8.8	9.0	9.4	9.2	9.0	7.7	7.2	6.4	6.1	5.6	5.5	5.3	6.7
7.5	7.9	8.3	8.8	8.8	8.7	8.6	7.8	6.9	6.2	5.8	5.4	5.1	4.7	6.2
7.5	7.9	8.2	8.6	8.5	8.4	8.2	7.5	6.4	5.2	4.8	4.5	4.4	4.7	5.9
7.1	7.6	8.0	8.2	8.2	8.1	7 8	7.0	5.9	4.9	4.6	4.6	4.3	4.0	5.6
6.3	6.2	7.0	7.3	7.5	7.7	7.2	6.2	5.1	4.4	4.2	4.0	4.1	4.0	5.0
7.0	7.4	7.8	8.0	8.0	7.5	6.8	5.5	4.6	4.3	4.2	4.1	3.9	3.9	5.2
7.9	8.1	8.2	8.3	8.5	7.9	7.0	5.9	5.6	5.5	5.2	5.1	4.9	4.6	6.1
8.6	8.8	9.3	8.9	8.7	8.4	7.5	6.8	6.6	6.4	6.3	6.3	6.1	6.0	7.0
8.1	8.0	8.4	8.4	8.1	7.5	6.7	6.4	6.3	6.3	6.5	6.5	6.7	6.5	7.0
7.84	8.13	8.54	8.68	8.70	8.45	7.89	7.10	6.35	5.89	5.66	5.50	5.31	5.20	6.35

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

ALPENA, MICH.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	9.7	9.6	9.4	9.2	9.4	9.3	9.2	9.1	8.9	9.5
Feb	8.9	9.0	9.0	8.8	8.6	8.7	8.5	8.5	8.6	9.6
Mar	8.2	7.9	7.5	7.7	8.0	8.0	7.6	8.3	8.8	9.9
Apr	7.3	7.2	7.4	7.4	7.6	7.9	8.0	8.7	9.7	10.3
May	6.5	6.4	6.4	6.5	6.7	6.7	6.7	7.9	8.6	9.6
June	5.3	5.3	5.2	5.0	5.2	5.4	5.7	6.8	7.8	8.7
July	5.2	5.0	5.0	5.0	5.2	5.5	5.9	6.7	7.6	8.1
Aug	5.6	5.5	5.6	5.6	5.7	5.6	5.5	6.0	7.1	8.2
Sept	6.6	6.5	6.4	6.2	6.6	6.6	6.7	7.2	8.0	8.8
Oct	8.3	8.0	7.8	7.8	7.7	7.7	7.6	7.8	8.7	9.6
Nov	9.1	8.9	8.8	8.8	8.6	8.8	8.8	8.9	9.1	10.1
Dec	8.6	8.6	8.5	8.3	8.7	9.0	8.9	9.2	9.5	9.9
Means	7.44	7.32	7.25	7.19	7.33	7.43	7.42	7.92	8.53	9.36

FORT APACHE, ARIZ.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1887.										
Jan*	4.6	4.5	4.2	4.1	3.8	3.7	3.5	3.2	3.2	3.1
Feb*	4.6	4.4	4.3	4.0	4.0	3.7	3.8	3.7	3.9	3.9
Mar*	5.0	4.5	4.4	4.7	4.4	4.5	4.2	4.0	3.9	3.6
Apr	5.6	4.9	4.9	4.5	4.6	4.5	4.3	4.1	4.0	4.5
May	5.1	4.5	4.0	3.9	4.0	4.1	3.9	3.7	3.7	3.6
June	5.1	4.6	4.2	3.9	3.9	3.7	3.6	3.3	3.3	3.0
July	4.5	4.2	4.2	4.0	3.6	3.5	3.3	3.3	3.2	2.8
Aug	4.3	4.3	3.9	4.0	3.8	3.6	3.5	3.3	3.0	2.9
Sept	4.4	4.2	4.0	4.0	3.8	3.6	3.5	3.6	3.4	3.5
Oct	4.9	4.5	4.6	4.2	4.2	3.9	3.7	3.7	3.7	3.5
Nov	4.2	4.3	3.8	3.8	3.5	3.0	3.0	3.1	2.8	2.7
Dec	4.0	3.8	3.8	3.6	3.6	3.4	3.7	3.7	3.5	3.7
Means	4.69	4.39	4.19	4.06	3.93	3.77	3.67	3.56	3.47	3.40

FORT ASSINNIBOINE, MONT.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	10.3	11.2	11.3	11.5	11.8	12.0	12.1	12.1	12.3	11.9
Feb	10.6	11.0	11.3	11.2	10.9	11.1	11.2	11.2	11.4	11.3
Mar	9.0	9.2	9.5	9.5	9.7	9.8	9.8	10.0	10.4	10.1
Apr	9.5	9.2	8.7	8.6	8.2	8.8	9.0	8.7	9.2	9.9
May	9.6	9.3	9.0	8.3	8.2	8.5	8.6	8.4	8.9	10.3
June	8.8	9.0	8.4	8.2	8.0	7.9	8.0	8.4	8.5	9.5
July	9.2	9.3	9.0	8.5	8.4	8.4	8.6	8.4	9.0	10.3
Aug	8.8	8.4	8.1	7.7	7.9	7.9	7.6	7.3	7.0	7.7
Sept	8.4	8.3	8.5	8.6	8.4	8.4	8.3	8.6	8.5	8.7
Oct	9.5	9.7	9.7	9.6	9.4	9.0	9.5	9.5	9.9	9.8
Nov	11.2	11.1	11.2	11.4	11.6	11.5	11.6	11.4	11.2	11.3
Dec	11.7	11.9	12.2	12.3	12.4	11.8	12.0	11.4	11.5	11.5
Means	9.72	9.80	9.74	9.62	9.58	9.59	9.69	9.62	9.82	10.19

* Six years' record.

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

ALPENA, MICH.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
10.4	11.1	11.4	11.5	11.6	11.5	11.2	10.4	10.1	10.0	9.8	9.9	10.1	9.8	10.1
10.6	11.3	11.5	11.7	11.8	11.8	11.8	11.1	10.0	9.5	9.6	9.4	9.4	9.8	9.9
10.7	11.4	11.7	12.6	12.7	12.7	12.7	12.1	10.6	9.9	9.6	9.2	9.1	8.1	9.9
10.9	11.7	12.3	12.6	12.8	12.9	12.6	11.4	9.8	8.4	7.6	7.5	7.2	7.2	9.4
10.7	11.4	12.4	12.8	12.4	12.3	12.1	11.3	10.0	8.2	7.0	6.9	6.8	6.5	8.9
9.8	10.7	11.0	11.4	11.7	11.4	11.0	10.4	9.1	7.3	5.8	5.1	5.1	5.1	7.7
9.1	10.4	11.3	11.6	11.7	11.4	11.0	10.5	9.3	7.7	6.2	5.8	5.4	5.3	7.7
9.2	9.9	11.0	11.4	11.8	11.9	12.0	11.4	9.7	7.8	6.5	6.3	6.0	5.9	8.0
10.2	11.4	12.1	12.5	12.8	12.8	12.5	11.6	9.7	8.0	7.0	6.7	6.6	6.7	8.8
10.7	11.3	11.6	11.9	12.0	12.1	11.6	10.6	9.4	8.9	8.7	8.5	8.6	8.5	9.4
10.9	11.5	11.7	12.0	12.1	12.0	11.4	10.5	10.0	9.8	9.8	9.7	9.7	9.3	10.0
10.4	11.2	11.5	11.6	11.7	11.3	10.8	10.4	10.2	10.1	10.1	9.6	9.5	9.2	9.9
10.30	11.11	11.62	11.97	12.09	12.01	11.72	10.98	9.82	8.80	8.14	7.88	7.79	7.62	9.13

FORT APACHE, ARIZ.

3.1	3.4	4.5	6.4	7.9	9.1	9.5	9.5	8.7	6.3	4.9	4.9	5.0	4.7	5.2
3.9	4.7	6.5	9.0	10.2	10.9	11.4	11.3	10.9	9.1	6.0	5.1	5.1	4.8	6.2
3.8	5.8	8.6	10.1	11.4	11.7	12.5	12.5	11.9	10.7	7.8	5.4	5.2	5.2	6.9
5.1	8.3	11.3	12.9	14.3	15.3	15.9	16.0	15.9	14.6	11.4	6.2	4.9	5.5	8.5
4.7	8.5	11.2	12.3	13.4	13.9	14.7	15.0	14.7	13.8	11.9	6.5	4.4	5.5	8.0
3.8	7.5	9.7	11.3	12.5	13.5	14.4	14.6	14.2	13.4	11.8	7.9	4.5	4.9	7.6
2.7	4.7	6.5	8.0	9.1	10.2	10.6	10.5	10.4	9.8	8.9	6.5	4.5	4.7	6.0
2.6	4.0	6.1	7.3	8.7	9.9	10.2	9.6	9.2	8.3	6.9	5.5	4.9	4.7	5.6
3.5	5.0	7.9	9.6	10.9	11.0	11.2	10.5	10.3	8.9	6.0	4.7	5.1	4.9	6.1
3.7	5.2	8.3	9.7	10.6	10.8	11.3	10.9	10.4	8.3	4.9	5.2	5.6	5.3	6.3
2.4	3.0	5.7	7.9	9.2	10.0	10.2	10.1	8.6	5.5	4.7	4.9	4.8	4.4	5.2
3.5	3.4	5.0	6.6	8.0	8.9	9.3	9.1	7.3	5.2	5.1	5.1	4.9	4.6	5.1
3.57	5.29	7.61	9.26	10.52	11.27	11.77	11.63	11.04	9.49	7.52	5.66	4.91	4.93	6.40

FORT ASSINNIBOINE, MONT.

12.0	11.7	11.8	12.0	12.0	11.7	11.4	11.2	11.0	10.8	10.6	10.5	10.4	10.6	11.4
11.7	12.2	12.5	12.4	12.2	12.6	12.5	12.4	12.3	10.2	10.0	10.1	10.5	10.6	11.4
10.5	11.4	12.1	12.3	12.0	11.8	12.0	12.0	12.1	10.9	9.5	8.6	8.7	9.3	10.4
11.2	12.6	12.6	13.1	13.1	13.0	13.9	14.0	13.9	13.2	10.9	9.7	9.0	9.7	10.8
11.3	12.0	12.0	12.5	12.8	12.7	13.0	13.0	12.9	12.7	11.3	9.5	8.6	9.4	10.5
10.0	9.9	10.5	11.0	11.7	11.5	11.6	11.3	11.3	10.9	10.1	8.6	8.1	8.7	9.6
10.8	11.0	11.0	11.2	11.8	11.8	12.0	11.7	12.1	11.5	10.4	8.9	8.5	9.0	10.0
9.0	9.4	9.5	9.6	10.1	10.1	10.1	10.4	10.3	9.8	8.7	7.7	8.1	8.6	8.7
9.9	10.8	11.7	12.4	13.1	12.8	12.9	12.8	12.4	11.0	8.8	8.7	9.3	8.9	10.0
10.6	12.2	13.5	13.6	14.1	14.0	13.8	13.3	12.1	10.2	9.6	9.6	9.7	9.6	10.9
11.4	12.5	14.1	15.1	15.9	15.4	14.7	13.3	11.2	10.1	10.6	10.5	10.8	10.9	12.1
11.5	12.1	12.7	13.3	13.9	13.5	13.2	11.5	10.7	10.6	10.6	10.7	10.8	11.6	11.9
10.82	11.48	12.00	12.38	12.72	12.58	12.59	12.24	11.86	10.99	10.09	9.42	9.38	9.74	10.65

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

ATLANTA, GA.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	10.9	11.0	11.2	11.2	11.1	11.1	11.1	10.9	11.3	11.4
Feb	10.8	10.9	10.7	10.1	10.2	10.3	10.0	9.9	10.3	10.6
Mar	10.2	10.1	10.1	10.2	10.1	10.1	10.0	10.0	10.5	11.2
Apr	9.1	9.3	9.2	8.9	8.8	8.8	8.6	8.7	9.6	10.0
May	7.9	8.0	7.9	7.8	7.7	7.7	7.3	7.4	8.0	8.6
June	6.6	6.6	6.8	6.9	6.9	6.9	6.7	7.0	7.5	7.6
July	6.6	6.5	6.6	6.5	6.3	6.3	6.1	6.3	6.8	7.0
Aug	5.9	5.8	5.7	5.6	5.6	5.8	5.6	5.5	6.1	6.5
Sept	8.2	7.9	7.7	7.6	7.5	7.7	7.6	7.4	7.8	8.2
Oct	8.7	8.6	8.3	8.3	8.2	8.4	8.4	8.4	8.7	9.1
Nov	9.8	9.8	9.8	9.8	9.4	9.4	9.1	9.4	9.3	9.5
Dec	9.9	10.0	9.9	10.0	9.8	10.0	9.7	9.6	9.8	10.0
Means	8.72	8.71	8.66	8.58	8.47	8.54	8.35	8.38	8.81	9.14

BISMARCK, N. DAK.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	6.9	6.7	6.8	6.7	6.4	6.2	6.2	6.2	6.2	6.2
Feb	6.9	7.1	7.2	7.0	7.4	7.3	7.5	7.6	7.3	7.6
Mar	7.8	7.7	7.5	7.6	7.1	6.9	6.9	6.9	6.9	7.5
Apr	8.1	7.9	7.5	7.4	7.2	7.2	7.0	7.5	8.5	9.9
May	6.9	6.5	6.5	6.6	6.5	6.4	6.3	6.4	7.6	9.0
June	7.1	6.9	6.6	6.6	6.6	6.8	7.1	7.1	8.2	9.4
July	6.3	5.9	5.6	5.7	5.3	5.0	5.3	5.7	6.9	8.0
Aug	6.4	6.0	6.0	5.8	5.7	5.6	5.4	5.5	6.1	7.0
Sept	6.8	6.9	6.6	6.3	6.4	6.4	6.3	6.2	6.9	8.1
Oct	7.0	6.8	6.8	6.7	6.6	6.8	6.6	6.8	7.0	7.9
Nov	6.4	6.2	6.3	6.4	6.5	6.5	6.8	6.6	6.6	6.6
Dec	6.5	6.4	6.4	6.1	5.8	5.7	5.9	5.9	6.1	6.1
Means	6.92	6.75	6.65	6.58	6.46	6.40	6.44	6.53	7.02	7.78

BOISÉ CITY, IDAHO.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	3.1	3.0	3.2	3.0	2.9	2.9	2.8	2.7	2.7	2.8
Feb	3.2	3.0	2.9	2.8	2.8	2.9	2.8	2.8	2.8	2.7
Mar	4.4	4.1	4.0	3.7	3.4	3.4	3.4	3.3	3.2	3.2
Apr	4.1	4.1	3.9	3.6	3.5	3.3	3.4	3.1	3.2	3.5
May	3.8	3.5	3.3	3.2	2.8	2.7	2.5	2.3	2.4	2.9
June	3.4	3.3	3.0	2.8	2.5	2.2	2.3	2.1	2.2	2.5
July	3.1	3.2	3.0	2.8	2.6	2.2	2.3	2.0	1.8	1.9
Aug	2.7	2.4	2.3	2.2	2.0	1.8	1.7	1.6	1.4	1.4
Sept	2.7	2.5	2.3	2.2	2.1	1.9	1.9	1.8	1.7	1.5
Oct	2.7	2.6	2.4	2.3	2.2	2.0	1.9	1.9	2.0	1.9
Nov	2.9	3.2	2.8	2.6	2.6	2.6	2.4	2.4	2.4	2.3
Dec	3.2	3.0	3.0	3.1	3.2	3.3	3.2	3.1	3.2	3.2
Means	3.28	3.16	3.01	2.86	2.72	2.60	2.55	2.42	2.42	2.48

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

ATLANTA, GA.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
11.6	11.3	11.9	11.7	11.9	11.5	11.2	10.2	9.8	10.1	10.6	10.7	10.7	10.8	11.1
10.8	11.1	11.3	11.6	11.7	11.8	11.6	10.5	9.5	9.5	9.8	10.2	10.7	10.9	10.6
11.8	12.2	12.3	12.6	12.8	12.9	12.6	12.0	10.6	9.9	10.2	10.6	10.5	10.5	10.9
10.2	10.4	10.6	10.9	11.1	11.3	11.4	10.8	9.2	8.0	8.2	8.5	8.8	8.9	9.4
9.1	9.4	9.8	10.1	10.5	10.7	10.5	9.9	8.7	7.5	7.6	7.6	7.9	8.0	8.6
8.1	8.5	8.7	8.6	9.1	9.1	9.0	8.6	7.7	6.6	6.5	6.8	7.0	6.6	7.5
7.3	7.6	7.7	7.8	7.9	8.0	8.0	7.4	6.9	6.1	6.3	6.6	6.8	6.7	6.9
7.0	7.2	7.2	7.5	7.7	7.3	7.4	7.2	6.4	5.4	5.8	6.0	6.0	6.0	6.3
8.5	8.9	9.0	9.0	9.0	8.9	8.8	8.4	7.1	7.1	7.5	7.5	7.9	8.1	8.1
9.6	9.9	9.6	9.6	9.7	9.7	9.3	8.3	7.6	8.1	8.5	8.6	8.6	9.0	8.8
9.8	10.1	10.2	10.3	10.2	10.1	10.1	8.7	8.8	9.2	9.5	9.7	9.9	9.9	9.6
10.2	10.8	10.7	10.7	10.6	10.5	10.0	9.0	9.2	9.4	9.8	9.9	10.1	10.3	10.0
9.50	9.78	9.92	10.03	10.18	10.15	9.99	9.25	8.46	8.08	8.36	8.56	8.74	8.81	8.99

BISMARCK, N. DAK.

6.4	7.0	7.7	8.3	8.8	9.1	9.1	8.0	7.1	6.8	6.7	6.8	6.7	6.7	7.1
7.9	8.8	9.5	10.5	11.0	11.3	11.0	10.5	9.2	8.1	7.4	7.0	6.8	7.0	8.3
8.6	9.6	10.1	10.8	11.5	11.5	11.2	11.0	10.2	9.0	8.4	7.6	7.4	7.6	8.6
11.5	12.6	13.0	13.6	13.8	13.7	13.8	13.2	12.6	11.4	9.5	8.8	8.5	8.3	10.1
10.1	11.0	11.6	12.3	12.4	12.4	12.3	12.2	11.7	11.0	9.2	7.7	7.4	6.8	9.0
10.7	11.8	12.4	12.5	12.5	12.5	12.3	12.0	11.6	10.7	9.0	8.1	7.5	7.8	9.3
8.8	9.7	10.0	10.5	10.9	10.9	10.7	10.4	9.9	9.3	8.3	6.9	6.8	6.8	7.9
8.1	9.1	10.2	10.6	11.1	10.8	10.8	10.4	9.7	8.7	7.6	7.2	7.2	6.8	7.8
9.7	11.3	12.5	12.9	13.5	13.6	13.6	13.0	11.7	9.2	7.9	7.5	7.4	6.8	9.1
9.3	10.7	11.6	12.5	12.9	12.9	12.6	11.6	9.9	8.4	7.8	7.5	7.3	7.0	8.8
7.6	8.6	9.5	10.1	10.8	10.8	10.5	8.9	7.9	7.3	7.0	6.8	6.5	6.0	7.6
6.4	7.1	8.4	9.2	9.3	9.4	9.1	7.9	7.0	6.5	6.6	6.5	6.4	6.7	7.0
8.76	9.78	10.54	11.15	11.54	11.58	11.42	10.76	9.88	8.87	7.95	7.37	7.16	7.02	8.39

BOISÉ CITY, IDAHO.

2.8	3.0	3.5	3.9	4.4	4.7	4.7	4.5	4.1	3.7	3.2	2.8	3.3	3.2	3.4
2.8	3.2	4.0	4.6	5.3	5.7	5.9	5.9	5.5	4.5	3.8	3.4	3.3	3.1	3.7
3.4	4.3	5.3	6.2	7.0	7.3	7.7	7.4	7.4	7.0	6.0	5.1	4.8	4.6	5.0
4.2	4.8	6.4	7.1	7.7	7.5	8.0	7.9	7.9	6.9	6.2	4.9	4.4	4.1	5.2
3.5	4.7	5.7	6.6	6.9	7.4	7.3	7.0	7.4	6.7	6.5	5.3	4.6	4.1	4.3
3.1	4.1	4.8	5.3	6.0	6.1	6.2	6.4	6.5	5.8	5.5	4.8	4.1	3.5	4.1
2.4	3.0	4.0	4.6	5.0	5.3	5.6	5.6	5.7	5.4	4.9	3.8	3.4	3.1	3.6
1.8	2.2	2.8	3.4	4.1	4.4	4.8	4.9	4.5	4.2	3.5	3.0	2.8	2.8	2.9
1.9	2.6	3.1	3.7	4.4	4.9	5.1	5.2	5.0	4.1	3.3	2.7	2.7	2.6	3.0
2.1	2.7	3.7	4.7	5.2	5.8	5.9	5.8	5.1	3.8	3.1	2.9	2.9	2.9	3.3
2.4	2.6	3.2	4.0	4.6	5.0	4.9	4.7	4.1	3.2	3.0	2.9	3.0	3.0	3.2
3.2	3.4	4.0	4.6	5.0	5.1	5.2	5.1	4.5	3.9	3.7	3.5	3.6	3.6	3.7
2.80	3.38	4.21	4.89	5.47	5.82	5.94	5.87	5.64	4.93	4.39	3.76	3.58	3.38	3.78

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

BOSTON, MASS.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	12.4	12.4	12.4	12.2	12.0	11.6	11.8	12.2	12.5	13.1
Feb	11.5	11.5	11.6	11.4	11.3	11.4	11.4	11.7	12.2	12.8
Mar	12.8	12.6	12.6	12.5	12.1	12.3	12.6	13.4	14.3	14.9
Apr	9.6	9.4	9.7	10.0	9.8	9.7	10.4	11.1	11.9	12.4
May	8.6	8.2	8.3	8.3	8.4	8.4	8.6	9.5	9.8	10.6
June	8.7	8.6	8.7	8.6	8.5	8.8	8.9	9.3	9.5	10.4
July	8.4	8.1	8.1	7.9	7.6	7.9	7.9	8.5	9.1	9.8
Aug	8.4	8.3	8.0	8.1	8.0	8.0	8.1	8.6	9.2	9.8
Sept	8.6	8.6	8.3	8.2	8.3	8.7	8.7	9.2	10.0	10.7
Oct	9.7	9.7	9.8	9.9	9.9	9.9	10.1	10.4	11.3	11.8
Nov	11.5	11.5	11.5	11.3	11.0	11.2	11.1	11.2	12.1	13.0
Dec	12.1	12.1	12.1	12.1	11.9	11.6	11.9	12.2	12.9	13.4
Means	10.19	10.08	10.09	10.04	9.90	9.96	10.12	10.61	11.23	11.89

BUFFALO, N. Y.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	14.3	14.2	14.2	14.4	14.5	14.4	14.4	14.6	15.1	15.0
Feb	12.8	12.6	12.8	12.9	12.7	12.6	12.7	12.9	13.3	13.6
Mar	10.3	10.4	10.5	10.6	10.4	10.4	10.5	10.7	11.5	12.0
Apr	8.5	8.4	8.2	8.2	8.4	8.4	8.2	9.0	9.6	10.2
May	7.8	8.1	8.1	7.7	8.2	8.3	8.5	8.6	9.2	9.8
June	7.3	7.1	7.0	7.2	7.6	7.6	7.7	8.3	9.1	9.6
July	6.5	6.4	6.6	6.4	6.4	6.6	7.0	7.3	7.9	8.8
Aug	7.0	6.7	6.6	6.8	6.8	6.6	6.8	7.4	8.3	9.1
Sept	7.9	7.9	8.2	8.1	7.9	7.8	8.0	8.4	9.0	9.3
Oct	9.6	9.8	9.8	9.8	9.7	9.7	9.7	10.0	10.5	11.0
Nov	13.3	13.3	13.2	13.2	13.2	13.1	12.8	12.7	13.2	13.8
Dec	13.5	13.4	13.3	13.2	12.8	13.1	13.2	13.2	13.5	13.9
Means	9.90	9.86	9.88	9.88	9.88	9.88	9.96	10.26	10.85	11.34

CHARLOTTE, N. C.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	4.6	4.6	4.7	4.7	4.7	4.8	4.9	5.0	5.4	6.1
Feb	5.5	5.5	5.1	5.1	5.2	5.2	5.3	5.5	5.9	6.8
Mar	5.5	5.4	5.4	5.0	5.0	4.9	4.9	5.1	6.2	6.7
Apr	5.5	5.1	5.2	4.8	4.9	4.7	4.7	5.5	6.7	7.2
May	4.0	3.8	3.7	3.5	3.4	3.4	3.6	4.5	5.3	5.7
June	3.8	3.6	3.5	3.4	3.4	3.5	3.8	4.4	5.0	5.3
July	3.3	3.1	3.1	3.1	3.1	2.9	3.1	3.9	4.4	4.7
Aug	3.3	3.2	3.1	3.2	3.3	3.1	3.3	4.0	4.6	5.1
Sept	4.3	4.1	4.1	4.0	4.1	4.0	4.1	4.5	5.2	5.8
Oct	4.2	4.1	4.0	4.1	4.0	4.1	4.1	4.2	5.2	5.6
Nov	4.2	4.1	4.1	4.2	4.2	4.1	4.1	4.1	4.8	5.7
Dec	4.0	3.9	4.0	3.8	4.0	3.9	4.1	4.0	4.4	4.9
Means	4.35	4.21	4.17	4.08	4.11	4.05	4.17	4.56	5.26	5.80

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

BOSTON, MASS.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
13.3	13.4	13.8	13.8	13.9	13.8	12.7	12.0	12.1	12.2	12.4	12.4	12.2	12.6	12.7
12.9	13.1	13.6	13.7	13.9	13.6	13.3	12.6	12.6	12.5	12.4	12.0	11.9	11.4	12.5
15.0	15.5	16.0	16.2	16.3	16.2	15.3	14.4	14.0	13.1	12.6	12.6	12.4	12.5	13.8
12.5	13.0	13.5	14.0	14.4	13.9	13.2	12.5	11.1	10.4	10.1	10.0	9.6	9.7	11.4
11.1	11.7	12.4	12.6	12.8	12.5	12.0	11.3	10.3	9.8	9.1	8.8	8.5	8.6	10.0
10.8	11.4	11.5	11.7	11.9	12.0	11.5	10.6	9.8	9.2	9.2	9.3	9.1	9.0	9.9
10.3	11.0	11.3	11.6	11.8	11.6	11.0	10.4	9.0	8.3	8.5	8.4	8.0	8.4	9.3
10.2	10.6	11.2	11.4	11.4	10.9	10.5	9.5	8.8	8.5	8.2	8.6	8.6	8.6	9.2
11.2	11.9	11.9	12.1	12.3	11.7	11.0	10.1	9.3	9.1	8.7	8.6	8.6	8.5	9.8
12.1	12.5	13.1	13.2	13.2	12.5	11.5	10.6	11.8	10.0	9.9	9.8	9.7	9.8	10.9
13.5	13.7	14.2	14.3	14.0	13.5	12.2	12.1	11.7	11.6	11.7	11.7	11.6	11.4	12.2
13.7	13.7	13.6	13.6	13.3	12.9	12.5	12.3	12.2	12.1	12.3	11.9	12.2	11.9	12.6
12.22	12.62	13.01	13.18	13.27	12.92	12.22	11.53	11.01	10.57	10.42	10.34	10.20	10.20	11.18

BUFFALO, N. Y.

15.1	15.4	15.4	15.6	15.6	15.6	15.3	14.9	14.9	14.8	14.7	14.5	14.4	14.6	14.8
13.8	14.1	14.7	14.9	15.0	14.8	14.6	14.2	13.4	13.2	13.2	13.0	13.2	12.8	13.5
12.4	13.2	13.7	13.8	14.0	14.1	13.8	13.1	12.3	11.6	11.6	11.0	11.1	10.6	11.8
10.9	11.4	11.6	12.1	12.0	11.7	11.4	10.8	9.7	9.2	8.8	8.7	8.8	8.8	9.7
10.4	10.7	10.7	10.8	11.1	11.2	10.9	9.9	9.0	8.5	7.8	7.7	7.6	7.6	9.1
10.8	10.9	11.0	10.9	10.6	10.3	10.1	9.0	8.7	7.7	7.2	7.1	7.4	7.2	8.6
9.6	10.3	10.9	11.2	11.2	10.9	10.5	9.9	9.1	8.0	7.2	7.1	6.7	7.8	8.3
10.2	10.7	11.2	11.2	11.2	10.6	10.4	10.4	9.3	8.4	7.9	7.7	7.6	7.1	8.6
9.9	10.6	10.9	10.8	10.9	10.7	10.4	10.0	8.9	8.7	8.6	8.8	8.8	8.3	9.1
11.6	12.2	12.5	12.5	12.4	11.9	11.5	10.6	10.2	10.2	10.2	9.7	9.8	9.7	10.6
14.3	14.3	14.7	14.8	14.9	14.1	13.7	13.2	13.1	13.1	13.0	13.0	13.2	13.4	13.5
14.2	14.4	14.6	15.3	15.5	14.8	14.7	14.8	14.4	14.4	14.4	14.2	14.4	13.6	14.0
11.93	12.35	12.66	12.82	12.87	12.56	12.28	11.73	11.08	10.65	10.38	10.21	10.25	10.12	10.98

CHARLOTTE, N. C.

6.4	6.6	6.7	6.8	6.8	6.8	6.2	5.2	5.0	5.1	5.3	5.2	5.0	4.9	5.5
7.0	7.3	7.4	7.6	7.6	7.5	7.0	6.1	5.3	5.3	5.4	5.4	5.7	5.5	5.8
7.2	7.5	8.0	8.1	8.6	8.5	8.3	7.7	6.4	6.0	6.0	6.1	5.8	5.7	6.4
7.3	7.3	7.4	7.6	7.8	7.8	7.4	6.9	5.8	5.2	5.2	5.3	5.6	5.6	6.1
6.0	6.1	6.3	6.4	6.6	6.6	6.3	6.0	5.0	4.0	4.0	4.2	4.2	4.1	4.9
5.6	5.8	5.9	6.2	6.6	6.3	6.2	6.0	5.2	4.2	4.2	3.9	3.9	3.8	4.7
4.8	4.8	4.7	5.0	5.0	5.1	5.2	4.9	4.2	3.5	3.4	3.5	3.3	3.4	4.0
5.1	5.3	5.3	5.4	5.6	5.4	5.4	4.9	3.9	3.4	3.4	3.4	3.3	3.4	4.1
6.2	6.2	6.2	6.2	6.2	6.0	5.7	4.7	4.1	3.9	4.1	4.2	4.2	4.2	4.8
6.1	6.1	6.4	6.3	6.0	5.9	5.3	4.2	4.0	3.9	4.1	4.3	4.3	4.5	4.8
6.0	6.2	6.4	6.6	6.3	5.9	5.1	4.1	4.2	4.2	4.1	4.0	4.2	4.5	4.8
5.3	5.7	6.0	5.8	5.9	5.6	4.8	4.0	4.1	4.2	4.3	4.2	4.1	4.2	4.6
6.08	6.24	6.39	6.50	6.58	6.45	6.08	5.39	4.77	4.41	4.46	4.48	4.47	4.48	5.05

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

CHATTANOOGA, TENN.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	6.5	6.5	6.2	6.2	6.1	6.1	6.1	6.1	6.5	6.5
Feb	6.3	6.3	6.0	6.0	6.0	5.9	6.0	5.9	6.2	6.9
Mar	6.3	6.5	6.4	6.1	5.9	5.8	5.7	5.9	6.6	7.3
Apr	5.2	5.1	5.1	5.1	5.2	5.0	4.9	5.3	6.5	7.5
May	3.7	3.7	3.7	3.6	3.7	3.5	3.4	4.0	4.9	5.5
June	3.0	2.9	2.8	2.9	2.9	3.0	2.8	3.3	4.3	4.8
July	3.5	3.2	3.0	3.0	3.1	3.0	3.1	3.3	4.1	4.7
Aug	2.8	2.8	2.6	2.7	2.7	2.6	2.5	2.9	4.0	4.7
Sept	2.8	2.7	2.7	2.6	2.8	2.8	2.8	2.9	3.8	5.2
Oct	3.8	3.7	3.7	3.9	3.8	3.8	3.9	3.8	4.8	5.6
Nov	4.4	4.6	4.5	4.7	4.8	4.7	4.5	4.6	4.8	5.8
Dec	5.5	5.4	5.3	5.1	4.9	4.9	4.9	5.0	5.2	5.8
Means	4.48	4.45	4.33	4.32	4.32	4.26	4.22	4.42	5.14	5.86

CHICAGO, ILL.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan*	9.8	9.5	9.5	9.3	9.2	9.4	9.5	9.4	9.8	10.1
Feb	9.1	8.6	8.3	8.2	8.2	8.4	8.5	8.8	9.1	9.7
Mar	8.5	8.5	8.4	8.4	8.3	8.3	8.6	8.9	9.4	9.8
Apr	8.9	9.0	8.9	9.2	9.2	8.9	9.3	9.8	10.6	11.2
May	8.0	8.0	8.0	8.0	7.9	7.7	8.0	8.7	9.3	10.0
June	6.4	6.2	6.3	6.1	6.1	6.1	6.5	7.1	7.7	8.2
July	6.2	5.9	5.8	5.8	5.8	5.9	6.0	6.7	7.4	7.9
Aug	6.4	6.2	6.2	6.2	6.2	6.3	6.4	6.8	7.5	8.1
Sept	7.5	7.3	7.3	7.2	7.2	7.0	7.2	7.4	8.2	8.8
Oct	8.6	8.2	8.2	8.1	8.0	8.1	8.3	8.2	9.3	9.8
Nov	9.4	9.0	8.8	8.8	8.8	8.9	9.1	9.5	9.9	10.4
Dec*	8.5	8.4	8.3	8.4	8.4	8.3	8.5	8.3	8.8	9.6
Means	8.11	7.90	7.83	7.81	7.78	7.78	7.99	8.30	8.92	9.47

CINCINNATI, OHIO.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	6.8	6.7	6.5	6.5	6.5	6.6	6.7	7.2	7.6	8.2
Feb	6.7	6.4	6.1	6.1	6.3	6.2	6.4	6.6	7.1	7.9
Mar	6.4	6.1	5.9	6.0	6.0	6.2	6.1	6.7	7.7	8.7
Apr	5.4	5.3	5.2	5.2	5.1	5.1	5.5	6.5	7.5	8.6
May	3.9	3.5	3.6	3.5	3.4	3.6	4.1	5.1	6.1	7.1
June	3.3	3.2	3.1	3.0	3.0	3.2	3.7	4.8	5.7	6.5
July	3.0	3.0	2.7	2.7	2.7	2.7	3.2	4.2	4.9	5.7
Aug	3.4	3.2	3.4	3.3	3.2	3.3	3.4	4.2	5.1	5.8
Sept	3.8	3.5	3.4	3.4	3.5	3.6	3.8	4.4	5.8	6.4
Oct	4.7	4.3	4.4	4.3	4.2	4.4	4.5	5.1	6.2	7.2
Nov	6.2	6.0	6.0	6.0	5.8	5.7	5.7	5.9	6.7	7.6
Dec	6.4	6.4	6.2	6.2	6.1	6.2	6.3	6.5	6.9	7.5
Means	5.00	4.80	4.71	4.68	4.65	4.73	4.95	5.60	6.44	7.27

* Six years.

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

CHATTANOOGA, TENN.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
6.8	7.2	7.4	7.6	7.8	7.9	7.8	7.5	7.0	6.7	6.3	6.1	6.2	6.0	6.7
7.4	7.7	7.9	8.4	8.8	8.7	8.7	8.5	7.7	7.4	6.9	6.6	6.7	6.4	7.0
8.0	8.5	8.9	9.5	9.7	9.7	9.6	9.3	8.4	7.4	6.7	6.7	6.6	6.2	7.4
7.9	8.5	8.7	9.2	9.1	9.1	9.3	8.9	7.8	6.6	6.0	5.4	5.3	5.1	6.7
6.2	6.8	7.2	7.7	7.9	8.1	8.3	7.9	6.9	5.5	5.0	4.2	4.0	3.7	5.4
5.5	6.1	6.3	6.4	6.6	6.6	6.7	6.2	5.8	4.6	3.9	3.5	3.5	3.2	4.5
5.2	5.8	6.1	6.3	6.6	6.4	6.3	6.3	5.5	4.3	3.8	3.4	3.5	3.5	4.5
5.2	5.4	5.7	5.9	6.3	6.1	6.0	5.9	4.9	3.9	3.5	3.0	3.0	2.9	4.1
5.6	6.1	6.3	6.4	6.5	6.5	6.5	5.9	4.8	3.9	3.5	3.2	2.9	2.9	4.3
6.3	6.6	6.7	6.8	7.1	7.0	6.9	6.1	5.1	4.6	4.3	4.0	4.0	3.8	5.0
6.4	6.8	7.1	7.4	7.6	7.4	7.4	6.5	5.9	5.3	5.2	5.0	4.8	4.7	5.6
6.4	6.6	6.9	7.0	7.2	7.3	7.3	6.6	6.4	6.0	5.8	5.6	5.8	5.7	5.9
6.41	6.84	7.10	7.38	7.60	7.57	7.57	7.13	6.35	5.52	5.08	4.72	4.69	4.51	5.60

CHICAGO, ILL.

10.6	10.7	11.4	11.5	11.6	11.7	11.3	10.5	10.4	10.2	9.9	10.1	9.9	10.2	10.2
9.9	10.1	10.7	10.9	11.2	11.3	11.0	10.5	10.4	10.0	9.9	9.8	9.3	9.3	9.3
10.2	10.7	11.3	11.4	11.8	11.7	11.3	10.7	9.9	9.2	8.8	8.5	8.5	8.7	9.7
11.5	11.8	12.1	11.9	12.1	12.3	12.0	11.4	10.6	9.7	9.2	9.1	8.8	9.1	10.3
10.5	10.8	10.9	11.3	11.4	11.4	11.2	10.8	10.1	8.9	8.0	7.9	7.8	8.0	9.3
8.6	9.1	9.4	9.8	10.0	10.0	9.7	9.0	8.8	7.7	7.0	6.4	6.5	6.5	7.7
8.5	9.0	9.5	9.7	10.0	10.1	10.0	9.6	8.8	7.6	6.7	6.6	6.3	6.4	7.6
8.6	9.3	9.6	9.8	10.1	10.0	9.8	9.4	8.5	7.5	7.0	6.8	6.7	6.6	7.8
9.2	9.4	9.6	10.0	10.3	10.2	10.1	9.5	8.2	7.6	7.7	7.7	7.6	7.7	8.3
10.2	10.6	11.0	11.0	11.1	10.9	10.4	9.6	9.1	8.4	8.5	8.5	8.6	8.6	9.2
10.6	10.9	11.3	11.0	11.0	10.9	10.2	9.6	9.4	9.2	9.3	9.3	9.3	9.4	9.8
9.9	9.9	10.2	9.9	9.9	9.7	9.4	9.1	9.0	8.7	8.7	8.8	8.6	8.6	9.0
9.86	10.19	10.58	10.68	10.88	10.85	10.53	9.98	9.43	8.72	8.39	8.29	8.16	8.26	9.01

CINCINNATI, OHIO.

8.5	8.6	8.8	9.0	8.9	8.7	8.6	8.0	7.5	7.2	6.9	6.8	6.8	6.8	7.5
8.4	8.6	9.1	9.1	9.3	9.3	9.2	8.7	8.0	7.2	6.8	6.6	6.8	6.6	7.5
9.2	9.6	10.3	10.5	10.7	10.8	10.7	10.0	8.9	7.9	7.4	7.0	6.7	6.7	8.0
9.4	9.9	10.3	10.2	10.3	10.3	10.3	9.8	8.9	7.0	6.2	5.8	5.6	5.3	7.4
8.0	8.5	9.0	9.0	9.2	9.1	8.9	8.8	7.4	5.7	4.8	4.4	4.1	4.0	6.0
7.5	8.1	8.2	8.3	8.7	8.6	8.3	7.8	7.3	5.6	4.4	4.0	3.6	3.5	5.6
6.6	7.1	7.5	7.7	8.4	8.2	8.1	7.8	7.0	5.5	4.1	3.6	3.2	3.0	5.1
6.7	7.3	7.6	7.9	7.9	7.9	7.8	7.6	6.8	5.5	4.7	4.0	3.6	3.6	5.3
7.1	8.0	8.3	8.3	8.4	8.2	8.1	7.6	6.2	5.0	4.5	4.3	3.9	3.9	5.6
7.9	8.7	8.9	9.3	9.2	9.3	8.6	7.7	6.3	5.5	5.0	4.7	4.4	4.7	6.2
8.4	9.0	9.5	9.3	9.4	9.1	8.5	7.5	6.7	6.0	6.4	6.3	6.1	6.2	7.1
8.1	8.7	9.1	9.2	9.1	9.0	8.2	7.4	7.0	6.7	6.6	6.6	6.4	6.4	7.2
7.98	8.51	8.88	8.98	9.12	9.04	8.78	8.22	7.33	6.23	5.65	5.34	5.10	5.06	6.55

CLEVELAND, OHIO.

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

Date.	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.
1884 to 1889.										
Jan	11.1	11.4	11.5	11.5	11.5	11.4	11.3	11.4	11.6	11.8
Feb	10.6	10.6	10.7	10.6	10.5	10.4	10.3	10.1	10.5	10.8
Mar	8.6	8.8	9.0	9.0	9.0	9.0	9.1	9.3	9.8	10.4
Apr	8.2	8.5	8.7	9.0	9.1	9.1	9.0	9.4	10.0	10.6
May	7.2	7.4	7.3	7.2	7.2	7.4	7.5	7.8	8.6	9.0
June	6.5	6.7	6.9	6.7	6.8	6.9	6.9	7.3	7.6	8.4
July	5.9	5.9	5.9	5.9	6.1	6.2	6.1	6.4	6.5	6.8
Aug	6.5	6.5	6.6	6.6	6.8	6.7	6.9	7.0	7.3	7.5
Sept	8.0	7.8	7.9	8.0	7.9	7.9	8.1	8.1	8.3	8.5
Oct	9.0	9.2	9.3	9.2	9.5	9.4	9.4	9.6	9.9	10.0
Nov	10.2	9.9	9.8	10.0	10.2	10.2	10.2	10.4	10.8	11.0
Dec	10.7	10.6	10.5	10.4	10.6	10.4	10.4	10.4	11.2	11.7
Means	8.54	8.61	8.68	8.68	8.77	8.75	8.77	8.93	9.34	9.71

FORT CUSTER, MONT.

Date.	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.
1879 to 1889.										
Jan*	6.5	6.4	6.6	7.0	6.8	7.0	7.0	6.8	6.5	6.6
Feb†	6.0	6.2	6.2	6.1	6.2	6.3	6.0	6.2	6.2	6.4
Mar*	6.3	6.1	6.2	6.0	5.9	5.9	5.6	5.9	6.1	6.5
Apr*	7.5	7.0	6.6	6.1	5.9	6.0	5.9	6.0	6.5	7.2
May*	6.9	6.6	6.4	5.8	5.6	5.7	5.5	5.7	6.1	6.6
June*	6.8	6.6	6.3	5.7	5.3	5.2	5.1	5.1	5.4	6.0
July*	7.1	6.3	6.0	5.6	5.4	4.9	4.6	4.7	4.8	5.2
Aug	6.7	6.3	5.6	5.3	5.0	4.9	4.7	4.7	4.5	4.7
Sept	5.7	5.8	5.5	5.2	5.1	5.0	4.6	4.6	4.8	5.2
Oct	5.6	5.8	5.8	5.7	5.6	5.5	5.3	5.1	5.1	5.1
Nov‡	5.8	5.8	5.7	5.7	5.7	5.6	5.4	5.4	5.3	5.6
Dec‡	6.0	6.0	6.3	6.1	6.2	6.1	6.0	6.0	6.0	6.0
Means	6.41	6.24	6.10	5.86	5.72	5.68	5.48	5.52	5.61	5.92

DENVER, COLO.

Date.	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.
1883 to 1889.										
Jan	7.3	7.3	7.1	7.1	7.2	7.0	7.2	7.6	7.6	7.5
Feb	6.5	6.2	6.5	6.8	6.8	6.9	6.6	6.4	6.2	6.3
Mar	5.7	6.0	5.9	5.9	5.4	5.2	5.4	5.4	5.4	6.0
Apr	6.7	7.2	6.7	6.4	6.4	6.1	5.7	5.7	5.9	6.2
May	6.3	6.2	5.9	5.4	5.3	5.1	4.9	4.8	4.7	5.2
June	6.6	6.6	6.4	5.9	5.9	5.5	5.1	4.9	4.8	5.4
July	7.0	6.2	6.3	6.1	5.6	5.4	5.1	4.9	4.7	4.7
Aug	5.9	6.0	5.8	5.4	5.3	4.9	4.5	4.4	4.4	4.3
Sept	6.3	6.4	6.1	6.0	5.9	5.8	5.5	5.4	5.1	4.8
Oct	5.2	6.2	5.8	5.8	5.5	5.3	5.5	5.6	5.8	5.4
Nov	6.5	6.4	6.4	6.6	7.0	7.0	7.2	7.0	7.0	7.2
Dec	7.1	6.9	7.0	7.0	7.0	7.0	7.0	7.0	6.8	6.9
Means	6.42	6.47	6.32	6.20	6.11	5.93	5.81	5.76	5.70	5.82

* Nine years. † Eight years. ‡ Ten years.

CLEVELAND, OHIO.

Day, Seventy-fifth Meridian Time, etc.—Continued.

11 a.m.	Noon.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	6 p.m.	7 p.m.	8 p.m.	9 p.m.	10 p.m.	11 p.m.	Mid.	Hourly means.
12.2	12.4	12.5	12.1	12.2	11.7	11.0	10.7	11.2	11.4	11.4	11.4	11.7	11.4	11.6
10.8	11.0	11.3	11.5	11.7	11.4	11.3	10.6	10.3	10.1	10.4	10.5	10.6	10.6	10.7
10.5	10.8	11.0	11.4	11.2	11.1	10.4	9.5	8.6	8.4	8.4	8.7	8.6	8.4	9.5
10.7	10.9	11.2	11.5	11.3	10.9	10.6	9.5	8.1	7.5	7.4	7.4	7.9	8.0	9.3
9.4	9.6	9.8	10.2	10.0	9.8	9.0	8.1	7.0	6.5	6.4	6.6	6.8	7.4	8.0
8.7	9.1	9.1	9.4	9.4	9.1	8.8	8.0	6.8	6.0	5.7	5.6	6.0	6.2	7.4
7.4	8.0	8.5	8.6	8.5	8.0	7.5	6.8	5.7	5.1	5.0	5.2	5.6	5.9	6.6
7.7	8.0	8.6	8.7	8.7	8.5	8.2	7.4	6.5	5.6	5.4	5.7	6.1	6.4	7.1
8.8	8.8	9.1	9.6	9.6	9.4	9.4	8.5	7.3	6.9	7.1	7.3	7.8	8.2	8.3
9.9	10.2	10.3	10.4	10.6	10.1	9.8	9.0	8.4	8.6	9.0	8.9	9.2	9.0	9.5
11.4	11.1	11.1	11.2	11.1	11.0	10.4	9.8	9.6	10.1	10.3	10.4	10.2	10.0	10.4
12.0	12.0	12.0	12.1	12.0	11.6	11.2	11.1	11.0	11.4	11.5	11.5	11.8	11.2	11.2
9.96	10.16	10.38	10.56	10.52	10.22	9.80	9.08	8.38	8.13	8.17	8.27	8.52	8.56	9.14

FORT CUSTER, MONT.

6.8	6.9	7.2	7.4	7.7	7.5	7.1	7.1	6.8	6.4	6.6	6.6	6.6	6.5	6.8
6.7	7.1	7.8	8.2	8.6	8.7	8.0	7.8	7.3	7.0	6.6	6.7	6.5	6.4	6.9
7.2	8.5	9.6	10.0	10.2	10.3	10.2	10.2	9.7	8.8	7.9	7.3	6.8	6.3	7.6
8.1	8.7	9.3	9.9	10.8	11.1	11.4	11.3	10.9	10.1	9.3	8.6	8.4	8.2	8.4
7.4	8.2	9.1	9.5	10.1	10.3	10.3	10.6	10.2	9.9	9.6	8.4	7.6	7.4	7.9
6.5	6.7	7.3	7.6	8.1	8.5	9.1	9.4	9.4	9.6	9.3	8.6	8.0	7.6	7.2
5.7	6.4	6.8	7.4	8.1	8.5	9.2	9.5	9.6	9.5	9.4	8.5	8.2	7.8	7.0
5.1	5.6	6.5	7.1	7.7	8.1	8.4	8.8	8.7	8.8	8.6	8.2	8.0	7.5	6.6
5.8	6.4	7.2	8.0	8.6	8.8	8.9	8.8	8.6	8.0	7.4	7.4	6.9	6.2	6.6
5.6	6.3	7.1	7.9	8.7	9.1	9.2	8.8	8.0	7.1	6.6	6.0	5.9	6.0	6.5
5.7	6.0	6.7	7.3	7.9	8.3	8.2	7.6	6.8	6.6	6.1	5.8	5.8	5.9	6.3
5.7	6.0	6.5	6.9	7.4	7.5	7.5	7.1	6.8	6.3	6.2	6.0	6.2	6.3	6.4
6.36	6.90	7.59	8.10	8.66	8.89	8.96	8.92	8.57	8.18	7.80	7.34	7.08	6.84	7.03

DENVER, COLO.

7.8	7.7	7.9	8.5	9.5	9.4	9.6	9.5	8.5	8.6	8.2	7.8	7.7	7.2	7.9
6.6	7.0	7.8	8.2	8.9	9.2	9.9	10.2	9.3	8.2	7.0	6.3	6.5	6.7	7.4
6.3	6.6	7.4	7.8	8.1	8.8	9.4	9.8	10.1	9.3	7.9	7.1	6.5	6.4	7.0
6.8	7.4	8.1	8.6	9.2	10.0	10.3	11.1	10.9	10.2	9.0	8.1	7.1	7.3	7.7
6.0	6.7	7.3	7.9	8.5	9.0	9.2	9.5	9.6	9.0	8.2	7.3	7.1	6.2	6.9
5.8	6.2	6.8	7.3	8.2	8.9	9.4	9.7	9.5	9.5	8.5	7.5	7.1	6.8	7.0
4.8	5.0	5.8	6.4	7.2	7.7	8.4	8.7	9.1	9.0	8.4	7.7	7.4	7.0	6.6
4.5	4.7	5.5	6.2	6.7	7.3	9.1	8.9	8.8	8.5	7.9	7.3	7.0	6.6	6.2
5.2	5.4	5.9	6.5	7.3	7.5	8.1	8.3	8.0	7.4	7.0	6.5	6.0	6.2	6.4
5.7	6.1	6.6	7.1	7.8	8.1	8.3	8.4	8.1	7.1	6.3	6.0	6.1	6.1	6.4
7.2	7.1	7.1	7.1	7.8	8.1	8.0	7.6	6.4	6.1	6.5	6.3	6.5	6.8	6.9
7.1	7.2	7.8	8.4	8.8	8.8	8.9	8.5	7.6	6.8	6.9	6.4	6.6	7.1	7.4
6.15	6.42	7.00	7.50	8.17	8.57	9.05	9.18	8.82	8.31	7.65	7.02	6.80	6.70	6.99

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

DETROIT, MICH.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	10.7	10.4	10.4	10.4	10.2	10.2	10.3	10.2	10.4	10.9
Feb	9.9	9.5	9.5	9.6	9.6	9.5	9.4	9.3	9.7	10.4
Mar	8.6	8.5	8.3	8.2	8.2	8.4	8.5	8.8	9.7	10.2
Apr	7.8	7.8	7.9	7.9	8.0	8.0	8.2	9.1	10.4	10.5
May	7.4	7.3	7.2	7.4	7.3	7.0	7.5	8.1	8.8	9.8
June	5.9	5.7	5.6	5.9	5.9	6.0	6.0	6.5	7.3	8.1
July	6.3	6.2	6.2	6.3	6.0	6.1	6.0	6.4	7.2	8.0
Aug	6.2	5.9	5.9	6.1	6.2	6.3	6.3	6.7	7.3	8.0
Sept	6.9	7.0	6.9	7.1	7.1	7.3	7.0	7.3	8.1	8.8
Oct	8.4	8.3	8.2	8.5	8.6	8.5	8.4	8.5	9.1	10.0
Nov	9.8	9.9	9.8	9.3	9.6	10.0	9.9	10.0	10.3	10.8
Dec	9.5	9.5	9.5	9.4	9.5	9.9	10.2	10.0	10.3	11.0
Means	8.12	8.00	7.95	8.01	8.02	8.10	8.14	8.41	9.05	9.71

DODGE CITY, KANS.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	9.5	10.0	10.0	10.0	9.8	9.9	9.9	9.8	9.8	9.8
Feb	9.8	9.6	9.3	9.5	9.7	9.8	9.7	9.5	9.5	10.0
Mar	10.8	10.6	10.3	9.7	9.5	9.8	9.2	9.2	9.9	11.7
Apr	9.8	11.6	11.1	11.0	11.1	10.8	10.9	11.2	13.1	15.5
May	12.2	11.3	10.5	10.6	10.4	9.9	9.7	10.2	12.4	14.7
June	12.1	11.1	10.3	9.8	9.3	9.2	8.9	9.4	11.3	12.9
July	10.8	10.4	9.6	9.0	8.7	8.2	8.0	8.8	10.2	12.5
Aug	10.4	10.1	9.4	9.1	8.3	8.1	8.2	8.3	9.7	12.0
Sept	10.1	9.9	9.5	9.3	9.0	9.0	9.0	8.6	9.7	12.5
Oct	9.6	9.1	8.7	8.7	8.7	8.5	8.1	8.0	8.4	10.6
Nov	7.4	7.5	7.4	7.4	7.6	7.3	7.3	7.3	7.6	8.5
Dec	8.7	9.1	9.3	9.2	9.4	9.1	8.8	8.9	8.9	9.1
Means	10.10	10.02	9.62	9.44	9.29	9.13	8.98	9.10	10.04	11.65

DUBUQUE, IOWA.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1884 to 1889.										
Jan	3.9	3.7	3.6	3.7	3.9	3.8	3.6	3.7	3.7	4.1
Feb	4.1	4.1	3.9	3.8	3.9	3.9	4.1	4.1	4.2	4.8
Mar	4.2	4.2	4.1	4.2	4.2	4.2	4.1	4.4	5.0	5.7
Apr	4.5	4.4	4.4	4.3	4.2	4.2	4.3	4.9	5.9	6.9
May	3.6	3.6	3.4	3.4	3.3	3.4	3.9	4.5	5.3	6.2
June*	2.7	2.5	2.6	2.4	2.4	2.6	3.0	3.8	4.4	4.9
July	2.3	2.3	2.2	2.1	2.2	2.3	2.6	3.2	4.1	4.3
Aug	2.5	2.4	2.3	2.3	2.5	2.5	2.5	3.0	3.9	4.7
Sept	3.6	3.4	3.3	3.2	3.2	3.2	3.2	3.4	4.2	5.2
Oct	3.4	3.5	3.3	3.2	3.4	3.3	3.3	3.3	4.3	5.3
Nov	3.6	3.5	3.5	3.5	3.7	3.6	3.5	3.7	3.9	4.7
Dec	4.3	3.8	3.8	3.8	3.7	3.6	3.5	3.7	3.7	4.0
Means	3.56	3.45	3.37	3.32	3.38	3.38	3.47	3.81	4.38	5.07

* Five years.

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

DETROIT, MICH.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
11.5	11.9	12.1	11.9	12.4	12.0	11.6	11.0	10.9	10.6	10.7	10.7	10.8	10.7	11.0
11.0	11.2	11.6	11.7	12.0	11.7	11.5	11.2	10.8	10.3	10.2	10.2	10.2	9.9	10.4
10.7	11.1	11.7	11.9	12.1	12.2	12.2	11.5	10.7	10.0	9.5	9.1	9.0	8.9	9.9
11.1	11.5	12.3	12.3	12.6	12.5	12.3	11.6	10.3	9.1	8.6	8.1	8.2	7.9	9.7
10.4	10.8	11.6	11.9	12.4	12.1	12.1	11.6	10.2	8.6	8.1	7.7	7.8	7.5	9.2
8.8	9.6	10.4	10.7	11.0	11.0	10.8	9.8	8.7	7.3	6.5	6.3	6.1	6.0	7.7
8.7	9.4	10.0	10.4	10.7	10.6	10.4	9.9	9.0	7.4	6.8	6.5	6.3	6.3	7.8
8.6	9.0	9.5	9.8	10.3	10.4	10.2	9.2	8.3	6.9	6.7	6.4	6.3	6.1	7.6
9.2	10.2	10.8	11.0	11.4	11.0	10.8	9.7	8.2	7.2	7.1	7.0	7.2	7.0	8.4
10.3	10.9	11.2	11.1	11.1	11.0	10.7	9.6	8.7	8.2	8.3	8.2	8.5	8.2	9.3
11.6	12.0	11.9	11.7	11.9	11.5	10.8	10.3	9.9	9.9	10.0	9.9	10.1	10.1	10.5
11.6	12.5	12.7	12.4	12.4	12.1	11.3	10.7	10.4	10.4	10.3	10.1	10.2	9.9	10.7
10.29	10.84	11.32	11.40	11.69	11.51	11.22	10.51	9.68	8.82	8.57	8.35	8.39	8.21	9.34

DODGE CITY, KANS.

10.8	11.7	12.2	12.8	13.2	13.2	12.7	12.0	10.1	9.3	9.6	9.7	9.8	9.7	10.6
11.8	11.8	13.3	13.5	13.4	13.6	13.4	13.1	11.3	9.3	9.0	8.9	9.6	10.1	10.8
13.7	14.6	14.7	14.6	14.8	14.7	14.3	14.7	13.4	11.3	10.7	10.5	11.2	11.3	11.9
16.6	16.8	17.3	17.2	17.6	17.9	18.0	17.8	17.2	15.4	13.1	12.7	13.0	12.7	14.2
15.0	14.7	15.1	15.2	15.1	15.9	16.3	16.2	15.9	14.7	12.6	12.1	12.1	12.1	13.1
13.5	13.6	13.9	13.7	14.0	14.5	14.8	14.9	15.1	14.6	12.8	11.8	12.4	12.4	12.4
12.7	13.0	13.0	13.5	14.0	14.1	14.6	14.3	14.1	13.5	12.2	11.3	12.0	11.1	11.6
12.7	13.0	13.1	13.2	13.6	13.7	13.7	14.0	14.0	13.3	11.4	11.2	10.6	10.5	11.3
14.1	14.6	14.9	14.6	14.8	15.0	15.0	14.9	14.3	11.4	10.2	10.2	10.6	10.0	11.7
12.8	13.6	13.9	14.1	14.1	14.1	13.8	13.4	11.7	10.0	9.7	10.1	10.3	9.7	10.8
10.5	11.7	12.5	12.9	13.1	13.0	12.7	11.2	8.5	7.8	7.5	7.5	7.5	7.2	9.1
10.8	11.9	12.8	13.3	13.1	12.9	12.5	11.0	9.5	8.7	8.8	9.1	9.5	8.8	10.1
12.92	13.42	13.89	14.05	14.23	14.38	14.32	13.96	12.92	11.61	10.63	10.42	10.72	10.47	11.48

DUBUQUE, IOWA.

4.7	5.0	5.4	5.9	6.0	5.9	5.7	5.1	4.7	4.6	4.4	4.4	4.2	4.1	4.5
5.3	5.8	6.2	6.7	6.9	6.9	6.5	6.2	5.3	5.1	4.9	4.7	4.5	4.4	5.0
6.4	7.4	7.4	7.6	7.8	7.6	7.5	6.9	6.0	5.2	4.8	4.8	4.7	4.6	5.5
7.2	8.0	8.3	8.6	8.8	8.8	8.7	8.0	6.8	5.7	4.8	4.4	4.5	4.6	6.1
6.8	7.2	7.5	7.7	8.0	7.7	7.5	7.2	6.4	4.9	4.1	4.1	3.8	3.7	5.3
5.8	6.2	6.3	6.8	6.8	7.2	6.4	6.2	5.4	4.8	3.1	2.7	2.7	2.7	4.3
5.5	6.2	6.2	6.3	6.5	6.5	6.3	5.9	5.4	4.1	3.2	2.8	2.4	2.3	4.1
5.2	6.4	6.3	6.4	6.6	6.4	6.2	5.8	4.7	3.3	2.7	2.5	2.4	2.7	4.0
6.1	6.9	7.5	7.5	7.7	7.4	7.0	6.0	4.4	3.3	3.3	3.4	3.6	3.7	4.7
6.1	6.9	7.3	7.3	7.4	7.1	6.5	5.3	4.2	3.8	3.6	3.6	3.5	3.6	4.7
5.5	6.2	6.8	6.9	7.0	6.6	6.0	5.0	4.3	4.0	3.9	4.1	3.8	3.6	4.6
4.9	5.5	5.7	5.8	5.8	5.7	5.4	4.8	4.4	4.2	4.1	4.1	4.1	3.9	4.4
5.79	6.64	6.74	6.96	7.11	6.98	6.64	6.03	5.17	4.42	3.91	3.80	3.68	3.66	4.77

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

DULUTH, MINN.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	7.4	7.1	7.1	6.7	6.6	6.8	6.7	6.5	6.7	6.6
Feb	7.2	7.1	6.8	6.7	6.7	6.6	6.8	6.6	6.9	7.4
Mar	7.2	7.0	6.8	6.9	7.3	6.9	6.9	6.7	7.0	7.3
Apr	6.8	6.7	6.6	6.6	6.7	6.8	6.9	7.3	8.2	9.1
May	5.9	6.2	6.0	5.8	5.7	5.8	6.0	6.3	6.1	8.2
June	4.4	4.7	4.8	4.9	5.1	4.8	4.9	5.2	5.8	6.5
July	5.3	5.5	5.6	6.1	6.0	5.9	5.6	5.8	6.2	6.6
Aug	5.8	5.8	5.8	5.9	6.0	5.7	5.4	5.5	6.0	6.7
Sept	5.8	5.7	5.7	6.1	6.3	6.5	6.6	6.4	7.0	8.1
Oct	6.4	6.0	6.1	6.5	6.8	7.1	7.1	7.3	7.2	7.7
Nov	7.4	7.6	7.6	7.6	7.6	7.1	7.2	7.2	7.3	7.7
Dec	7.5	7.1	7.3	7.0	6.9	6.9	7.0	7.0	7.1	7.1
Means	6.42	6.38	6.35	6.40	6.48	6.41	6.42	6.48	6.79	7.42

EASTPORT, ME.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	12.6	12.8	12.5	12.3	12.3	12.2	12.4	12.7	12.7	13.2
Feb	12.7	12.4	12.5	12.7	12.8	12.3	12.2	12.5	12.9	12.9
Mar	11.7	12.1	12.2	12.1	12.2	12.2	12.2	12.2	12.5	12.8
Apr	7.9	8.2	8.5	8.7	8.6	9.0	9.5	10.2	10.2	10.3
May	6.0	6.1	6.3	6.1	6.3	6.4	7.0	7.7	8.3	8.8
June	4.7	4.7	4.6	4.6	4.9	5.2	5.6	6.1	6.8	7.3
July	5.0	4.7	4.7	4.8	4.7	4.9	5.1	5.6	6.0	6.5
Aug	4.8	4.7	4.6	4.6	4.6	4.7	4.9	5.4	6.3	6.6
Sept	5.8	5.8	6.0	6.1	5.9	6.1	6.5	7.1	7.5	7.9
Oct*	9.0	8.9	9.1	9.4	9.3	9.6	9.6	9.8	10.9	11.3
Nov*	10.0	10.6	10.4	10.6	11.1	11.0	11.3	11.7	10.5	12.8
Dec*	11.9	11.6	11.6	11.6	11.9	12.0	12.1	12.3	12.5	12.9
Means	8.51	8.55	8.58	8.63	8.72	8.80	9.03	9.44	9.76	10.28

EL PASO, TEX.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	4.4	4.3	4.3	4.2	4.0	3.9	3.8	3.7	3.7	3.7
Feb	4.8	4.8	4.5	4.2	4.1	4.3	4.2	4.0	3.8	3.5
Mar	4.9	4.9	4.9	4.6	4.6	4.6	4.4	4.0	4.0	4.2
Apr	5.2	5.1	5.1	5.0	4.6	4.7	4.8	4.5	4.4	4.8
May	5.2	5.2	5.2	4.9	4.9	4.8	4.8	4.7	4.7	5.4
June	5.5	5.7	5.3	5.0	4.9	4.4	4.1	4.4	4.4	4.9
July	4.5	4.4	4.6	4.7	4.6	4.0	3.7	3.8	3.7	4.3
Aug	4.4	4.2	4.4	4.7	4.9	4.5	4.1	4.0	3.9	4.3
Sept	3.6	3.6	3.9	4.2	3.8	3.6	3.3	2.9	3.1	3.9
Oct	3.5	3.4	3.5	3.4	3.4	3.4	3.3	3.2	3.2	3.7
Nov	3.7	3.7	3.5	3.4	3.4	3.3	3.4	3.5	3.5	3.7
Dec	3.8	4.1	4.3	4.2	3.7	3.7	3.8	3.8	3.7	3.7
Means	4.46	4.45	4.46	4.38	4.24	4.10	3.98	3.88	3.84	4.18

* Six years.

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

DULUTH, MINN.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
7.1	7.5	7.8	7.7	7.8	7.6	7.1	6.6	6.6	6.9	7.5	7.5	7.3	7.2	7.1
8.1	8.2	8.6	8.8	9.1	9.0	8.9	8.1	7.1	7.0	7.4	7.6	7.5	7.2	7.6
7.9	8.4	8.8	9.2	9.3	9.4	9.2	8.6	7.9	7.1	6.9	7.2	7.2	6.9	7.7
10.0	10.2	10.7	10.9	11.1	10.9	10.6	10.1	9.2	8.0	7.1	6.6	6.5	6.8	8.4
8.6	9.2	9.7	10.2	10.3	10.2	9.9	9.1	8.5	7.1	5.6	5.3	5.7	5.7	7.4
7.2	8.1	8.3	8.2	8.2	8.0	8.1	7.5	6.6	5.7	4.8	4.5	4.1	4.3	6.0
7.2	7.7	8.0	8.3	8.3	8.4	8.2	7.6	6.9	5.6	5.4	5.6	5.6	5.5	6.5
7.4	7.8	8.2	8.3	8.4	8.6	8.3	7.7	6.3	5.3	5.0	5.5	5.7	5.7	6.5
8.9	9.6	9.9	10.0	10.1	9.9	9.4	8.6	7.1	6.3	6.4	6.3	6.1	6.0	7.4
8.2	8.4	9.0	9.1	9.6	9.5	9.2	8.1	7.0	6.6	6.6	6.5	6.4	6.4	7.4
8.1	8.3	8.4	8.6	8.8	8.6	8.3	7.4	7.1	7.5	7.9	7.9	8.0	7.5	7.8
7.4	7.5	7.7	7.8	7.9	7.7	7.1	6.7	6.9	7.8	8.3	8.1	7.9	8.0	7.4
8.01	8.41	8.76	8.92	9.08	8.98	8.69	8.01	7.27	6.74	6.58	6.55	6.50	6.43	7.28

EASTPORT, ME.

13.6	13.5	13.7	13.8	13.4	13.3	12.9	12.5	12.8	12.8	13.0	12.9	13.0	12.9	12.9
12.8	12.4	12.2	12.1	12.3	12.1	11.8	11.4	11.4	12.2	12.7	12.8	12.9	12.7	12.4
12.6	12.4	12.4	12.2	12.3	12.4	12.3	12.0	11.7	11.5	11.8	12.0	11.9	11.8	12.2
10.5	10.8	10.6	10.7	10.7	10.4	10.4	9.1	8.4	8.3	8.3	8.3	8.3	8.2	9.3
9.1	9.6	9.8	9.8	9.7	9.5	9.0	8.2	7.1	6.8	6.5	6.5	6.2	6.1	7.6
7.9	8.6	9.0	9.2	9.1	8.9	8.5	7.3	6.5	5.9	5.9	5.4	5.2	4.9	6.5
7.2	7.9	8.2	8.2	8.0	7.6	7.2	6.6	5.7	5.4	5.1	4.9	4.9	5.2	6.0
6.7	7.0	7.6	7.6	7.6	7.1	6.8	5.8	5.3	5.2	5.1	4.9	4.7	4.8	5.7
8.5	9.0	9.2	9.4	9.2	8.5	7.6	6.8	6.7	6.4	6.4	6.4	6.4	6.2	7.1
11.1	11.0	10.9	11.0	10.6	10.0	9.5	9.1	9.2	9.2	9.2	9.0	9.1	9.0	9.8
13.0	13.0	12.4	12.1	11.8	11.2	10.7	10.7	10.8	10.4	10.5	10.3	10.5	10.2	11.2
13.0	13.0	13.0	12.7	12.4	12.2	12.0	12.0	12.2	12.2	12.2	11.9	12.0	12.0	12.2
10.50	10.68	10.75	10.73	10.59	10.27	9.80	9.29	8.98	8.86	8.89	8.78	8.76	8.67	9.42

EL PASO, TEX.

4.1	4.8	5.7	6.2	6.9	7.1	7.2	6.8	6.4	5.0	4.2	4.4	4.3	4.2	4.9
4.3	5.5	6.3	6.8	7.6	8.1	8.5	8.3	8.2	6.8	5.5	5.1	4.8	5.0	5.6
5.4	6.4	6.9	7.4	7.9	8.2	8.3	8.4	8.2	7.5	5.8	4.9	4.9	4.7	5.8
6.0	7.0	8.0	8.6	9.0	9.4	9.9	9.6	9.8	9.3	7.1	5.7	5.3	5.5	6.6
6.0	6.7	7.5	7.7	8.0	8.3	8.5	8.6	8.7	8.5	7.5	5.5	5.1	5.0	6.3
5.3	5.7	6.2	6.3	6.4	6.8	6.7	6.8	7.5	7.4	6.9	5.8	5.4	5.3	5.7
4.5	4.6	4.7	4.6	4.8	4.9	5.5	5.7	6.2	6.2	5.7	4.5	4.6	4.5	4.7
4.8	5.0	5.1	4.9	5.2	5.3	5.7	6.1	6.0	5.6	4.8	4.2	4.2	4.0	4.8
4.7	5.5	5.7	5.6	5.8	5.9	5.9	6.1	5.6	5.2	4.5	4.1	3.6	3.6	4.5
4.4	5.0	5.5	5.8	6.2	6.3	6.2	5.9	5.6	4.1	3.3	3.4	3.7	3.8	4.3
4.3	4.9	5.5	6.0	6.4	6.6	6.8	6.3	5.3	4.1	4.0	4.1	4.0	3.9	4.5
4.2	4.9	5.9	6.7	7.1	7.0	7.2	6.7	5.8	4.5	4.0	4.4	4.0	3.8	4.8
4.83	5.50	6.08	6.38	6.78	6.99	7.20	7.11	6.94	6.18	5.28	4.68	4.49	4.44	5.20

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

FORT SMITH, ARK.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	5.5	5.4	5.5	5.5	5.4	5.4	5.5	5.6	5.6	6.0
Feb	5.3	5.4	5.4	5.3	5.5	5.3	5.5	5.5	5.5	5.9
Mar	5.1	5.2	5.1	5.1	5.1	5.2	5.4	5.4	5.8	6.3
Apr	4.4	4.3	4.5	4.7	4.7	4.9	4.9	5.0	5.7	6.2
May	3.2	3.1	3.3	3.4	3.5	3.3	3.5	4.0	4.6	5.0
June	2.6	2.5	2.7	3.0	3.0	2.9	3.0	3.3	3.1	4.6
July	1.9	2.0	2.1	2.1	2.1	2.2	2.4	2.7	3.0	3.2
Aug	2.5	2.5	2.7	2.6	2.7	2.6	2.6	2.9	3.4	3.8
Sept	3.1	2.8	3.0	2.8	3.0	3.0	3.1	3.0	3.7	4.5
Oct	3.1	3.0	3.3	3.4	3.4	3.3	3.3	3.3	3.6	4.4
Nov	3.7	3.6	3.7	3.6	3.5	3.6	3.6	3.6	3.8	4.3
Dec	4.4	4.3	4.5	4.6	4.5	4.6	4.8	4.8	4.8	5.2
Means	3.73	3.68	3.82	3.84	3.87	3.86	3.97	4.09	4.38	4.95

FORT GRANT, ARIZ.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	6.7	6.4	6.3	5.9	5.9	5.7	5.6	5.3	5.3	5.0
Feb	7.3	6.9	6.6	6.4	6.4	5.9	5.7	5.8	5.5	5.4
Mar	6.5	6.0	5.8	5.7	5.5	5.6	5.4	5.1	4.7	4.4
Apr	6.5	6.1	5.8	5.7	5.4	5.2	5.1	4.8	4.3	4.7
May	6.1	6.1	6.0	5.8	5.8	5.9	5.7	5.4	4.9	4.9
June	6.2	6.2	5.9	5.7	5.8	5.4	5.2	4.7	3.8	4.3
July*	5.7	5.2	4.9	4.7	4.3	4.0	3.7	3.4	2.9	3.2
Aug	5.3	4.9	4.8	4.6	4.4	4.4	4.0	4.3	3.6	3.7
Sept	6.9	6.4	6.4	6.1	5.8	5.7	5.7	5.4	5.1	5.0
Oct	6.7	6.6	6.4	6.0	5.8	5.4	5.2	5.1	4.7	4.4
Nov	6.8	6.4	5.8	5.7	5.4	5.1	5.0	5.1	4.9	4.4
Dec	6.2	5.7	5.7	5.4	5.5	5.9	5.7	5.4	5.4	5.3
Means	6.41	6.08	5.87	5.64	5.50	5.35	5.17	4.98	4.59	4.56

GALVESTON, TEX.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1884 to 1889.										
Jan	11.8	11.7	12.5	12.0	11.9	12.3	11.8	12.4	12.4	12.5
Feb	10.9	11.0	11.0	10.7	10.9	11.0	10.4	10.5	10.8	11.3
Mar	10.3	10.2	10.2	10.0	10.2	10.4	9.9	10.1	10.4	11.0
Apr	11.4	11.2	11.0	10.8	11.0	11.3	10.7	10.9	11.2	12.1
May	11.9	10.5	10.0	9.6	9.4	9.8	9.8	9.7	10.1	10.5
June	9.0	8.9	8.8	8.8	8.8	8.6	8.0	7.7	8.6	9.0
July	8.0	7.7	7.4	7.0	6.9	6.7	6.3	6.4	7.1	7.9
Aug	8.7	8.4	8.2	8.1	8.0	8.1	7.8	7.4	8.0	8.7
Sept	10.7	10.8	10.7	10.6	10.4	10.7	10.6	10.4	10.8	11.1
Oct	9.9	9.6	9.4	9.1	9.6	9.9	9.7	9.6	10.1	10.5
Nov	8.9	8.9	8.9	8.8	9.0	9.1	8.6	8.9	9.0	9.4
Dec	9.3	9.1	9.2	9.0	9.2	9.6	9.6	9.9	10.2	10.3
Means	10.07	9.83	9.78	9.54	9.61	9.79	9.43	9.49	9.89	10.36

* Six years.

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

FORT SMITH, ARK.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
6.4	6.7	7.0	7.0	7.2	7.4	7.4	7.0	6.2	5.7	5.5	5.2	5.1	5.4	6.0
6.3	6.6	6.9	7.3	7.8	7.6	7.6	7.4	6.8	5.9	5.6	5.5	5.1	5.6	6.1
6.8	7.1	7.6	7.9	8.3	8.6	8.6	8.3	7.7	6.4	5.9	5.6	5.2	5.4	6.4
6.9	7.4	7.7	7.9	8.3	8.5	8.4	8.4	7.7	6.2	5.3	4.9	4.5	4.9	6.1
5.6	6.1	6.1	6.5	6.8	6.7	6.9	6.9	6.1	4.6	3.5	3.2	2.8	3.2	4.7
4.7	5.2	5.2	5.4	5.9	5.8	5.5	5.3	4.6	3.7	3.0	2.6	2.5	2.6	3.9
3.5	4.2	4.5	4.6	4.9	4.9	4.9	4.8	4.3	3.4	2.5	2.1	1.8	2.1	3.2
4.2	4.6	5.0	5.0	5.2	5.4	5.3	5.2	4.6	3.4	2.7	2.7	2.4	2.5	3.6
4.7	5.2	5.5	5.6	5.8	5.9	5.7	5.7	4.7	3.4	3.0	2.7	2.8	3.0	4.0
4.8	5.1	5.3	5.7	5.9	5.9	5.9	5.5	4.1	3.4	3.2	2.9	2.8	3.4	4.1
4.7	5.3	5.7	6.1	6.1	6.1	5.8	5.2	4.2	3.9	3.8	3.7	3.6	3.9	4.4
5.9	6.3	6.5	6.9	6.8	7.0	6.8	6.2	5.2	5.1	4.9	4.8	4.7	4.8	5.4
5.38	5.82	6.08	6.32	6.58	6.65	6.57	6.32	5.52	4.59	4.08	3.82	3.61	3.90	4.81

FORT GRANT, ARIZ.

4.5	5.2	6.3	6.7	7.5	8.2	8.7	8.9	8.5	7.2	6.8	6.9	7.0	6.9	6.6
5.5	6.6	7.7	8.8	9.6	10.2	10.7	10.9	9.9	8.7	7.3	7.3	7.0	7.0	7.5
5.1	6.3	7.9	8.7	9.4	9.8	10.2	10.4	10.1	9.0	7.2	6.8	6.6	6.5	7.0
6.0	7.3	8.2	9.2	10.4	11.2	11.8	12.5	12.3	11.5	9.2	7.3	6.6	6.6	7.7
5.9	7.2	8.3	8.9	9.6	9.7	10.3	10.4	10.6	10.6	9.3	6.7	6.3	6.2	7.4
5.1	6.0	7.1	8.0	8.5	9.3	9.6	10.5	10.6	10.7	10.0	7.6	6.6	6.4	7.0
3.8	4.8	5.9	6.7	7.5	8.2	8.3	9.0	9.2	9.2	8.8	7.3	6.6	6.4	6.0
4.4	5.1	6.2	7.0	7.7	8.0	7.8	8.2	8.1	7.6	6.8	6.4	5.8	5.4	5.8
6.0	7.1	8.2	9.0	9.2	9.5	9.7	9.5	8.9	8.3	6.9	6.9	7.1	7.2	7.2
5.6	6.9	8.2	8.5	8.9	9.1	9.2	9.1	8.8	7.2	6.8	6.9	7.0	6.9	6.9
5.0	6.2	7.4	8.0	8.4	8.3	8.6	8.5	7.9	6.9	7.1	7.2	7.3	7.0	6.6
5.4	6.1	7.0	7.7	8.2	8.4	8.6	8.4	7.6	6.6	6.7	6.8	6.8	6.5	6.5
5.19	6.23	7.37	8.10	8.74	9.16	9.46	9.69	9.38	8.62	7.74	7.01	6.72	6.58	6.84

GALVESTON, TEX.

12.8	13.1	12.6	12.1	11.9	11.8	11.5	11.8	11.2	11.0	11.0	11.2	11.3	12.2	11.9
11.8	12.5	12.3	11.9	11.8	11.9	12.0	11.6	11.1	10.8	10.8	10.7	11.1	12.0	11.3
11.9	12.3	12.0	11.9	12.0	12.0	12.1	12.0	11.4	10.9	10.8	10.6	10.7	11.1	11.0
12.8	13.5	13.5	13.3	13.3	12.9	13.1	13.6	12.5	11.9	11.5	11.4	11.7	12.6	12.1
11.2	12.0	11.9	11.7	11.9	12.0	12.6	12.8	11.8	11.2	10.6	10.6	10.8	11.5	11.0
9.2	10.0	10.2	10.4	10.9	10.6	10.8	11.2	10.4	9.6	9.0	8.9	9.0	9.7	9.4
8.4	9.1	9.4	9.9	10.4	10.8	11.2	11.4	10.2	9.0	8.0	7.7	7.8	8.3	8.5
9.3	9.8	10.0	10.2	10.5	10.5	10.9	11.0	9.8	9.1	8.6	8.6	9.0	9.1	9.1
11.3	12.1	11.9	11.8	11.9	11.6	11.6	11.7	10.4	9.7	9.7	9.8	10.5	10.7	10.9
11.1	11.3	10.9	10.7	10.9	10.5	10.4	10.3	9.3	9.0	9.1	9.3	9.7	10.4	10.0
9.8	10.2	9.7	9.6	9.4	9.2	9.3	9.5	8.8	8.7	8.6	8.7	9.0	9.1	9.1
10.9	11.4	11.4	11.2	11.0	10.9	10.8	10.7	10.2	10.0	10.0	10.3	10.3	9.9	10.2
10.88	11.44	11.32	11.22	11.32	11.22	11.36	11.48	10.59	10.08	9.81	9.82	10.08	10.55	10.37

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

HELENA, MONT.

Date.	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.
1883 to 1889.										
Jan	5.5	5.5	5.3	5.0	4.9	4.9	4.8	4.9	5.0	5.3
Feb	6.4	6.5	6.4	6.3	5.7	5.7	5.7	5.4	5.5	6.1
Mar	7.2	6.7	6.5	6.2	5.8	6.0	5.8	5.4	5.4	5.3
Apr	7.3	7.1	7.0	6.7	6.5	6.3	6.1	6.0	5.6	5.0
May	7.3	7.1	6.8	6.6	6.4	6.3	6.0	5.7	5.0	5.0
June	7.5	7.1	7.1	6.8	6.2	5.8	5.7	5.2	4.1	4.3
July	7.4	6.8	6.7	6.7	6.4	6.4	5.9	5.0	3.8	3.5
Aug	7.1	6.8	6.6	6.5	6.2	5.4	5.6	4.8	4.3	3.0
Sept	6.7	6.7	7.4	6.4	6.0	5.8	5.7	5.6	5.2	4.3
Oct	7.0	6.7	6.4	6.3	6.0	5.7	5.3	5.1	5.2	4.9
Nov	5.5	5.3	5.0	5.2	5.3	5.1	4.9	4.9	4.7	4.8
Dec	5.1	4.8	4.5	4.2	4.1	4.4	4.3	4.1	4.1	4.3
Means	6.67	6.42	6.31	6.08	5.79	5.65	5.48	5.18	4.82	4.65

HURON, S. DAK.

Date.	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.
1883 to 1889.										
Jan	9.1	9.3	9.4	9.3	8.9	8.6	8.5	8.8	8.4	8.8
Feb	8.5	8.6	8.5	8.4	8.4	8.3	8.5	9.0	9.0	9.3
Mar	8.1	8.3	8.4	8.4	8.6	8.8	8.5	8.7	9.0	10.0
Apr	9.7	9.7	9.7	9.4	9.3	9.1	9.2	9.5	10.2	11.8
May	8.9	8.8	8.6	8.7	8.8	8.6	8.7	9.3	10.5	11.6
June	8.5	8.3	8.4	8.2	7.9	7.9	8.0	8.7	9.9	10.7
July	7.5	7.2	6.9	6.9	6.8	6.5	6.6	6.9	7.9	9.2
Aug	7.6	7.2	6.8	6.8	6.8	6.6	6.4	6.6	7.7	8.8
Sept	8.7	8.4	8.6	8.6	8.5	8.3	8.2	8.3	9.0	10.4
Oct	8.7	8.7	8.4	8.2	8.4	8.4	8.6	8.4	8.6	9.6
Nov	8.3	8.2	8.4	8.4	8.6	8.0	7.9	8.0	8.0	8.2
Dec	8.9	9.2	9.1	8.9	8.6	8.4	8.3	8.1	8.2	8.1
Means	8.54	8.49	8.43	8.35	8.30	8.12	8.12	8.36	8.87	9.71

JACKSONVILLE, FLA.

Date.	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.
1883 to 1889.										
Jan	4.8	4.7	4.9	5.0	4.9	5.1	5.0	4.7	5.4	6.2
Feb	4.3	4.1	4.3	4.2	4.4	4.6	4.5	4.6	5.0	5.6
Mar	4.7	4.4	4.6	4.5	4.5	4.6	4.6	5.1	6.3	7.4
Apr	5.4	5.2	5.0	5.1	4.8	4.8	4.6	5.3	6.4	7.4
May	5.4	5.1	5.1	4.8	4.5	4.4	4.2	5.2	6.0	6.4
June	5.6	5.4	5.2	5.0	5.0	4.7	4.7	5.2	5.9	6.4
July	6.5	6.0	6.1	6.1	6.0	5.4	5.2	5.7	6.1	6.3
Aug	5.0	4.7	4.6	4.6	4.5	4.4	4.0	4.5	5.0	5.6
Sept	4.4	4.3	4.3	4.3	4.3	4.2	4.4	4.4	5.5	6.4
Oct	5.2	5.0	5.0	4.9	5.0	5.2	5.0	5.1	6.0	7.4
Nov	5.0	4.8	4.9	4.9	5.2	5.0	4.8	4.9	5.6	6.4
Dec	4.2	4.2	4.4	4.5	4.5	4.5	4.6	4.2	4.8	5.6
Means	5.04	4.82	4.87	4.82	4.80	4.74	4.63	4.91	5.67	6.42

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

HELENA, MONT.

11 a.m.	Noon.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	6 p.m.	7 p.m.	8 p.m.	9 p.m.	10 p.m.	11 p.m.	Mid.	Hourly means.
5.2	5.3	5.2	5.7	6.1	6.1	6.3	6.3	5.7	5.8	6.0	5.9	5.9	6.1	5.5
6.1	6.0	6.5	7.0	7.5	7.5	7.4	7.7	7.1	6.6	6.9	6.5	7.1	6.9	6.5
5.1	5.1	5.8	6.6	7.5	7.9	8.1	8.0	8.0	7.8	7.4	7.5	7.9	7.4	6.7
5.5	6.0	6.7	7.4	8.4	8.8	9.1	9.2	9.1	8.9	7.9	7.2	7.8	8.1	7.2
5.6	6.2	6.6	7.0	8.0	8.8	9.3	9.7	9.8	9.0	8.6	7.6	7.2	7.8	7.2
4.7	5.2	6.0	6.6	7.6	8.0	8.3	8.3	8.6	8.2	7.8	7.4	7.1	7.3	6.7
4.1	4.2	4.9	4.9	6.7	7.4	7.7	8.3	9.0	8.9	8.3	7.2	6.8	7.2	6.5
3.0	3.6	4.0	4.6	5.1	5.6	6.2	6.9	6.9	7.4	6.4	6.5	6.9	7.1	5.7
4.1	4.6	5.1	6.1	6.5	6.8	7.2	7.4	7.4	6.9	6.5	7.4	7.6	7.3	6.2
4.5	4.7	5.3	6.0	6.8	7.2	7.4	7.3	6.9	7.1	8.0	7.7	7.8	7.6	6.4
4.3	4.6	4.8	5.0	5.9	6.2	6.3	6.0	5.5	6.0	6.4	6.3	6.3	5.8	5.4
4.2	4.1	4.1	4.3	4.8	5.0	5.1	4.9	4.9	5.3	5.3	5.2	5.5	5.0	4.6
4.70	4.97	5.42	5.93	6.74	7.11	7.37	7.50	7.41	7.32	7.12	6.87	6.99	6.97	6.22

HURON, S. DAK.

9.1	9.6	10.2	10.5	11.1	11.4	11.1	10.1	9.0	8.6	8.9	8.8	9.2	9.0	9.4
10.3	10.7	10.9	12.0	11.9	11.7	11.6	11.3	10.1	9.5	9.2	9.1	9.1	8.9	9.7
10.7	11.1	11.3	11.8	12.1	12.0	12.1	11.5	10.6	9.3	8.9	8.5	8.5	8.3	9.7
13.1	13.6	14.4	15.2	15.5	15.7	15.7	14.9	13.9	12.6	10.6	9.9	10.0	10.0	11.8
12.4	12.9	13.3	13.2	13.6	13.8	13.7	13.3	12.9	11.5	9.6	9.0	9.1	8.9	10.8
11.3	11.7	12.1	12.3	12.5	12.8	12.9	12.6	12.2	10.1	9.3	8.5	8.5	8.5	10.1
9.8	10.1	10.4	10.6	10.9	11.1	11.2	11.0	10.7	9.6	8.3	7.8	7.6	7.6	8.7
9.4	10.0	10.6	11.2	11.0	11.0	11.1	10.4	10.0	8.6	7.7	7.9	8.0	7.8	8.6
11.8	12.5	12.9	13.7	13.7	13.8	13.8	13.4	11.7	9.4	8.7	8.8	8.9	8.6	10.4
10.9	11.5	12.2	12.7	13.2	13.2	13.0	11.8	9.5	8.6	8.9	8.9	9.0	8.9	9.9
9.2	10.1	10.9	11.4	11.7	11.8	11.3	9.2	8.0	7.8	8.0	8.0	7.9	8.0	9.0
8.6	9.5	10.3	10.8	11.1	10.8	10.4	9.2	8.5	8.8	9.0	9.1	9.2	9.1	9.2
10.55	11.11	11.62	12.12	12.36	12.42	12.32	11.56	10.59	9.53	8.92	8.69	8.75	8.63	9.77

JACKSONVILLE, FLA.

7.1	7.6	8.3	8.4	8.6	8.4	7.7	6.5	5.6	5.3	5.2	4.9	4.9	4.3	6.0
6.2	7.0	7.5	8.2	8.0	7.8	8.0	7.3	5.9	4.8	4.8	4.4	4.2	4.0	5.6
8.3	8.6	8.9	9.1	9.3	9.3	9.1	8.3	6.5	5.3	4.9	4.7	5.1	5.2	6.4
8.2	9.0	9.4	9.9	10.3	10.0	10.0	9.4	7.7	6.3	5.6	5.3	5.4	5.5	6.9
6.8	7.1	7.4	7.8	8.1	8.6	9.2	8.9	7.6	6.2	5.5	5.2	5.5	5.0	6.3
7.0	7.6	7.8	8.5	9.3	9.5	9.6	9.1	8.1	6.7	6.2	5.6	5.7	6.1	6.7
6.8	6.9	7.2	8.0	8.8	9.3	9.6	9.3	8.7	7.2	6.6	6.6	6.8	5.8	6.9
6.1	6.4	6.8	7.9	8.6	8.9	9.0	8.6	7.5	6.0	5.3	4.8	4.8	4.7	5.9
7.3	8.0	8.6	8.7	9.2	8.9	8.9	8.0	6.4	5.1	4.6	4.3	4.5	5.1	6.0
8.6	9.1	9.2	9.4	9.4	9.4	8.9	7.3	5.8	5.1	5.2	5.1	5.3	4.8	6.5
7.4	8.1	8.3	8.5	8.8	8.7	8.0	6.2	5.3	4.8	4.8	4.8	4.8	4.8	6.0
6.3	7.0	7.6	8.0	8.0	7.8	7.2	5.8	5.3	4.8	4.6	4.5	4.3	5.2	5.5
7.18	7.70	8.08	8.53	8.87	8.88	8.77	7.89	6.70	5.63	5.28	5.02	5.11	5.04	6.22

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

KEOKUK, IOWA.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1884 to 1889.										
Jan	8.0	8.1	7.9	7.9	7.7	7.8	7.6	7.5	7.7	7.9
Feb	8.0	8.0	8.0	8.2	8.4	8.2	8.1	8.1	8.7	9.3
Mar	8.3	8.0	8.2	7.8	7.8	7.7	7.7	7.7	8.6	9.4
Apr	8.8	8.7	8.7	8.3	8.0	7.8	8.0	8.5	9.5	10.6
May	6.1	6.2	5.9	5.7	5.7	5.7	6.1	6.6	7.4	8.0
June	5.0	5.0	5.0	4.9	4.8	4.7	4.7	5.2	6.0	6.5
July	5.7	5.3	5.1	4.9	4.8	4.6	4.8	5.1	5.9	6.5
Aug	5.8	5.7	5.5	5.7	5.5	5.3	5.3	5.5	6.2	7.0
Sept	6.8	6.9	6.4	6.1	6.0	6.1	6.3	6.6	7.5	8.2
Oct	6.4	6.4	6.2	5.8	5.8	5.8	5.8	6.0	6.6	7.4
Nov	7.2	7.0	7.0	7.0	6.8	7.1	7.2	7.2	7.5	8.3
Dec	7.8	7.4	7.3	7.2	7.3	7.4	7.5	7.6	7.6	7.9
Means	6.99	6.89	6.77	6.62	6.55	6.52	6.59	6.80	7.43	8.08

KNOXVILLE, TENN.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	5.7	6.0	6.0	6.0	5.9	5.7	5.6	5.7	5.8	6.5
Feb	5.9	5.8	5.5	5.3	5.3	5.4	5.6	5.7	6.3	6.8
Mar	4.6	4.5	4.5	4.4	4.3	4.5	4.6	4.9	5.9	6.8
Apr	5.0	4.9	4.8	4.6	4.6	4.4	4.3	4.6	5.8	6.8
May	3.4	3.2	3.3	3.2	3.0	2.9	3.1	3.9	5.0	5.9
June	2.8	2.7	2.7	2.7	2.6	2.6	2.9	3.8	4.7	5.3
July	2.5	2.5	2.5	2.5	2.4	2.5	2.8	3.5	4.5	5.2
Aug	2.7	2.6	2.7	2.6	2.6	2.4	2.5	3.1	4.1	4.9
Sept	2.8	2.6	2.7	2.7	2.9	2.8	2.7	3.0	3.9	4.9
Oct	3.3	3.2	3.4	3.6	3.2	3.4	3.3	3.5	4.5	5.3
Nov	4.2	4.1	4.2	4.0	3.9	4.2	4.2	4.2	4.9	5.7
Dec	4.5	4.5	4.4	4.3	4.3	4.2	4.1	4.4	4.7	5.5
Means	3.95	3.88	3.89	3.82	3.75	3.75	3.81	4.19	5.01	5.80

LEAVENWORTH, KANS.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	6.2	6.2	6.2	6.3	6.2	6.1	6.2	6.0	6.1	6.7
Feb	6.1	6.2	6.2	6.3	6.6	6.6	6.5	6.5	6.7	7.6
Mar	6.5	6.5	6.4	6.3	6.4	6.1	6.1	6.2	6.8	7.9
Apr	6.5	6.5	6.2	5.9	6.1	5.9	6.0	6.2	7.4	9.1
May	4.6	4.4	4.6	4.3	4.6	4.6	4.7	5.1	6.3	7.6
June	4.0	4.2	4.0	3.6	3.5	3.4	3.5	4.5	5.6	6.3
July	3.9	3.8	3.7	3.6	3.6	3.6	3.1	4.2	5.3	6.2
Aug	3.8	3.8	3.8	3.7	3.8	3.6	3.4	3.6	4.9	6.1
Sept	4.5	4.3	4.3	4.1	4.1	3.9	4.1	4.1	5.0	6.4
Oct	4.5	4.4	4.4	4.3	4.4	4.3	4.3	4.4	5.0	6.3
Nov	5.4	5.0	5.1	5.2	5.1	4.7	4.8	4.9	5.2	6.1
Dec	5.7	5.5	5.7	5.7	5.8	5.9	6.1	6.2	6.4	6.8
Means	5.14	5.07	5.05	4.94	5.02	4.89	4.90	5.16	5.89	6.92

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

KEOKUK, IOWA.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
8.5	8.9	9.2	9.3	9.5	9.0	8.7	8.2	8.0	8.1	8.0	8.1	8.1	8.0	8.2
9.9	10.1	10.4	10.6	10.9	10.7	10.4	9.9	9.2	8.6	8.3	8.1	8.1	8.1	9.0
9.8	10.3	10.7	11.0	11.4	11.4	11.3	10.7	9.5	8.6	8.5	8.7	8.7	8.4	9.2
11.3	11.9	12.4	12.6	12.9	12.6	12.7	11.8	10.8	9.6	8.9	8.7	8.5	8.8	10.0
8.9	9.3	9.6	9.6	9.7	9.9	9.5	9.0	8.2	7.1	6.3	6.2	6.0	6.0	7.5
7.4	7.6	7.9	8.2	8.3	8.3	8.2	8.0	7.4	6.3	5.3	5.2	5.3	5.4	6.3
7.2	7.5	7.9	8.3	8.4	8.2	8.0	7.8	7.3	6.3	5.5	5.5	5.9	6.0	6.4
7.9	8.5	8.8	8.7	8.7	8.6	8.5	8.4	7.2	6.1	5.8	5.8	5.8	5.8	6.8
8.8	9.3	9.6	9.8	10.2	10.0	9.7	9.0	7.8	6.8	7.0	7.3	7.3	7.1	7.8
8.4	8.7	9.4	9.6	9.7	9.6	9.4	8.0	6.5	6.5	6.7	6.8	6.9	6.8	7.3
8.9	9.6	10.0	10.2	10.3	10.1	9.4	8.3	7.4	7.5	7.7	7.7	7.6	7.5	8.1
8.9	9.4	9.4	9.6	9.8	9.8	9.4	8.4	8.4	8.1	8.2	7.8	7.8	8.0	8.2
8.82	9.26	9.61	9.79	9.98	9.85	9.60	8.96	8.14	7.47	7.18	7.16	7.17	7.16	7.89

KNOXVILLE, TENN.

7.1	7.5	7.8	8.1	8.2	8.0	7.9	7.1	6.4	6.1	6.0	5.7	5.7	5.9	6.5
7.2	7.7	8.1	8.8	9.1	9.0	8.2	7.8	6.9	6.2	6.0	5.9	6.1	5.9	6.7
7.5	7.7	8.1	8.3	8.5	8.8	8.5	8.1	7.0	6.0	5.4	5.1	5.2	4.8	6.2
7.4	8.0	9.0	9.2	9.5	9.5	9.0	8.5	7.5	6.3	6.0	5.5	5.5	5.1	6.5
6.6	7.1	7.8	8.2	8.4	8.4	8.1	7.7	7.0	5.5	4.7	4.3	4.1	3.6	5.4
5.8	6.2	6.6	7.0	7.2	7.2	7.1	6.9	6.2	4.9	3.9	3.4	3.3	2.9	4.4
5.7	6.1	6.3	6.5	6.7	6.5	6.6	6.2	5.7	4.3	3.3	3.0	3.0	2.7	4.3
5.4	5.7	6.1	6.4	6.7	6.7	6.4	6.1	5.1	3.3	3.0	2.7	2.8	2.8	4.2
5.6	6.0	6.6	7.0	7.0	6.8	6.7	6.2	5.0	3.9	3.1	3.0	3.2	3.0	4.3
5.7	6.1	6.4	6.6	6.9	6.9	6.6	5.8	4.8	4.0	3.6	3.4	3.6	3.1	4.6
6.3	6.5	6.8	7.2	7.3	7.2	6.7	5.7	5.2	4.8	4.6	4.5	4.3	4.2	5.2
6.0	6.6	7.1	7.3	7.3	7.1	6.6	5.8	5.4	5.2	5.1	4.9	4.8	4.8	5.4
6.36	6.77	7.22	7.55	7.73	7.68	7.37	6.82	6.02	5.04	4.56	4.28	4.30	4.07	5.31

LEAVENWORTH, KANS.

7.4	8.0	8.4	8.6	8.9	9.1	8.7	8.2	7.2	6.6	6.5	6.4	6.4	6.2	7.0
8.6	8.9	9.3	9.5	9.5	9.5	9.5	8.7	7.5	6.5	6.3	6.3	6.1	6.3	7.4
8.8	9.3	9.9	10.2	10.5	10.7	10.6	10.0	8.7	7.4	6.7	6.6	6.7	6.5	7.8
10.2	10.8	11.1	11.4	11.8	11.6	11.8	11.2	9.9	8.1	6.9	6.6	6.6	6.4	8.3
8.7	9.2	9.4	9.7	9.7	9.7	9.7	9.0	8.2	6.7	5.3	4.8	4.7	4.7	6.7
7.0	7.6	7.8	8.3	8.5	8.3	8.1	7.7	7.0	6.5	5.2	4.4	4.2	4.0	5.7
7.0	7.4	7.6	7.9	8.0	8.0	7.8	7.6	6.6	5.3	4.1	3.9	3.8	3.5	5.4
7.1	7.6	7.9	8.1	8.2	8.1	7.9	7.6	6.8	5.6	4.3	3.8	4.0	4.0	5.5
7.8	8.5	8.8	9.0	9.3	9.1	8.9	8.1	6.7	5.2	4.5	4.5	4.7	4.7	6.0
7.5	8.1	8.8	8.9	9.3	9.0	8.9	7.6	5.9	4.9	4.7	4.6	4.7	4.5	6.0
7.3	7.8	8.4	8.9	9.3	9.2	8.4	7.1	5.8	5.5	5.3	5.5	5.7	5.4	6.3
7.5	8.2	8.7	8.8	9.1	9.0	8.7	7.5	6.6	6.2	6.1	6.0	5.9	5.9	6.8
7.91	8.45	8.84	9.11	9.34	9.28	9.08	8.36	7.24	6.21	5.49	5.28	5.29	5.18	6.59

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

LITTLE ROCK, ARK.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	5.6	5.6	5.4	5.3	5.4	5.2	5.2	5.4	5.3	5.9
Feb	5.6	5.5	5.4	5.4	5.4	5.4	5.5	5.6	6.0	6.7
Mar	5.5	5.3	5.4	5.6	5.3	5.3	5.4	5.4	6.1	6.8
Apr	5.1	5.2	5.2	5.3	5.4	5.5	5.4	5.7	6.9	7.5
May	3.4	3.5	3.6	3.6	3.6	3.8	3.9	4.5	5.5	6.4
June	2.6	2.5	2.3	2.5	2.5	2.6	2.7	3.4	4.4	4.8
July	2.2	2.1	2.3	2.4	2.2	2.4	2.5	2.8	3.8	4.4
Aug	2.5	2.4	2.4	2.5	2.5	2.5	2.6	3.0	4.0	4.6
Sept	2.4	2.5	2.5	2.6	2.7	2.8	2.7	2.8	3.6	4.5
Oct	3.4	3.4	3.6	3.4	3.5	3.4	3.5	3.6	4.4	5.3
Nov	4.3	4.2	4.2	4.1	4.3	4.3	4.4	4.2	4.5	5.0
Dec	4.9	4.9	4.9	4.9	5.1	5.2	5.1	5.0	5.5	6.0
Means	3.96	3.92	3.93	3.97	3.99	4.03	4.08	4.28	5.00	5.66

LOUISVILLE, KY.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	8.7	8.6	8.6	8.6	8.5	8.3	8.4	8.4	8.8	9.4
Feb	7.8	8.0	7.8	7.7	7.3	7.9	8.1	8.2	8.5	9.0
Mar	7.6	7.7	7.5	7.5	7.5	7.3	7.5	7.8	8.4	9.1
Apr	6.2	6.0	6.1	6.1	6.3	6.5	6.4	6.9	8.0	8.8
May	5.1	5.0	5.0	5.0	5.2	5.1	5.3	6.0	7.1	7.8
June	4.4	4.3	4.3	4.2	4.2	4.4	4.5	5.3	6.2	6.9
July	3.8	3.6	3.7	3.6	3.7	3.8	3.9	4.4	5.1	5.7
Aug	4.1	4.2	4.0	3.8	4.0	4.0	4.1	4.5	5.2	5.8
Sept	4.3	4.4	4.2	4.3	4.3	4.5	4.5	4.9	5.7	6.5
Oct	5.2	5.2	5.2	5.3	5.1	5.2	5.3	5.3	6.0	7.1
Nov	6.9	6.9	6.8	6.6	6.4	6.3	6.5	6.6	7.1	7.9
Dec	7.5	7.2	7.2	7.1	7.1	7.4	7.2	7.5	7.9	8.5
Means	5.97	5.92	5.87	5.82	5.80	5.89	5.98	6.32	7.00	7.71

LYNCHBURGH, VA.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	3.2	3.1	3.0	3.0	3.0	3.2	3.4	3.5	3.9	4.7
Feb	3.6	3.4	3.6	3.5	3.5	3.5	3.6	3.8	4.5	5.0
Mar	3.9	3.9	3.6	3.9	3.9	3.6	3.8	4.2	5.2	6.4
Apr	3.1	2.9	2.8	2.7	2.7	2.9	3.1	3.9	5.0	5.8
May	2.3	2.2	2.2	2.2	2.1	2.1	2.4	3.2	4.3	4.8
June	1.8	1.7	1.8	1.7	1.7	1.8	2.2	3.1	4.0	4.6
July	1.4	1.3	1.4	1.2	1.2	1.2	1.5	2.4	3.1	3.7
Aug	1.4	1.4	1.3	1.4	1.3	1.4	1.6	2.2	3.1	3.7
Sept	1.6	1.6	1.6	1.7	1.8	1.7	1.9	2.3	3.2	4.1
Oct	1.9	2.0	2.0	1.9	2.0	2.0	2.1	2.5	3.2	4.2
Nov	3.3	3.0	2.8	2.6	2.7	2.7	2.7	2.9	3.4	4.4
Dec	3.2	3.0	3.0	3.0	2.8	2.8	2.8	3.0	3.4	4.0
Means	2.56	2.46	2.42	2.40	2.39	2.41	2.59	3.08	3.86	4.62

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

LITTLE ROCK, ARK.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
6.5	6.8	6.9	7.0	7.0	6.9	6.8	6.5	5.6	5.3	5.3	5.6	5.4	5.8	5.9
7.3	7.4	7.8	7.8	7.8	7.9	7.7	7.3	6.6	5.7	5.5	5.7	5.7	5.7	6.4
7.6	8.1	8.2	8.1	8.3	8.2	8.3	8.0	7.2	6.2	6.1	5.8	5.8	5.8	6.6
8.0	8.6	8.5	8.7	8.8	8.5	8.6	8.4	7.3	6.0	5.3	5.2	5.2	5.3	6.7
7.0	7.5	7.6	7.4	7.7	7.6	7.6	7.4	6.5	5.0	4.2	3.9	3.7	3.6	5.4
5.3	5.8	6.0	6.1	6.3	6.4	6.3	6.4	5.8	4.7	3.7	3.0	2.9	2.8	4.2
4.9	5.4	5.8	6.0	6.1	6.1	6.3	6.0	5.3	4.1	3.2	2.7	2.5	2.4	3.9
5.2	5.8	6.1	6.2	6.5	6.4	6.8	6.8	6.0	4.4	3.5	3.2	3.0	2.7	4.2
5.0	5.8	6.1	6.4	6.6	6.3	6.4	6.2	4.7	3.6	3.1	3.0	2.7	2.6	4.1
6.1	6.6	6.6	6.6	6.8	6.7	6.5	6.0	4.3	3.5	3.5	3.5	3.4	3.4	4.6
5.7	6.2	6.7	7.0	6.9	6.9	6.7	5.7	4.6	4.2	4.2	4.2	4.1	4.3	5.0
6.8	7.2	7.3	7.4	7.4	7.3	7.0	6.4	5.3	5.0	5.0	4.9	4.9	4.9	5.7
6.28	6.77	6.97	7.06	7.18	7.10	7.08	6.76	5.77	4.81	4.38	4.22	4.11	4.11	5.23

LOUISVILLE, KY.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
9.7	9.9	10.0	10.1	10.2	10.1	9.9	9.5	9.2	9.0	9.0	8.7	9.0	8.9	9.2
9.6	10.0	10.3	10.5	10.5	10.7	10.7	9.8	9.2	8.9	8.8	8.6	8.4	8.0	9.0
9.8	10.3	10.6	10.6	11.2	11.2	11.1	10.6	9.8	8.5	8.3	8.1	7.9	7.6	8.9
9.5	10.2	10.6	10.9	11.0	11.3	11.1	10.6	9.4	8.2	7.6	7.4	7.2	6.5	8.3
8.6	9.6	9.8	10.0	10.1	10.3	10.3	9.8	8.6	6.9	6.1	5.8	5.6	5.2	7.2
7.9	8.4	8.8	9.3	9.7	9.9	9.7	9.0	7.9	6.5	5.5	5.2	4.9	4.6	6.5
6.5	7.3	8.0	8.3	8.4	8.5	8.6	8.4	7.6	6.0	4.9	4.3	3.9	4.1	5.7
6.7	7.5	8.0	8.2	8.6	8.6	8.6	8.1	7.3	6.0	5.1	4.6	4.3	4.1	5.8
7.4	8.2	8.6	8.6	8.6	8.6	8.2	7.8	6.3	5.6	5.3	5.0	4.7	4.4	6.0
8.0	8.6	8.8	9.0	9.0	8.8	8.4	7.6	6.3	6.0	5.8	5.4	5.2	5.2	6.6
8.4	9.1	9.4	9.7	10.0	9.7	8.8	8.1	7.5	7.4	7.4	7.2	7.2	7.0	7.7
9.1	9.5	9.8	9.8	9.9	9.6	8.9	8.3	8.3	8.2	8.1	7.8	7.9	7.8	8.2
8.43	9.05	9.39	9.58	9.77	9.78	9.52	8.97	8.12	7.27	6.82	6.51	6.35	6.12	7.42

LYNCHBURGH, VA.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
5.2	5.6	5.6	5.8	5.8	5.6	5.1	4.5	3.7	3.7	3.6	3.4	3.6	3.4	4.1
5.6	5.7	5.9	6.1	6.3	6.0	5.9	5.0	4.1	3.7	3.5	3.4	3.4	3.4	4.4
6.6	6.8	6.9	7.3	7.4	7.6	7.7	6.9	5.8	5.2	4.7	4.5	4.3	4.2	5.4
6.2	6.5	6.9	6.8	6.8	6.8	6.8	6.0	5.1	4.1	3.8	3.4	3.3	3.2	4.6
4.7	5.5	5.8	5.8	5.9	6.0	6.0	5.5	4.4	3.4	3.1	2.6	2.5	2.4	3.8
5.0	5.1	5.3	5.5	5.4	5.4	5.4	4.9	3.8	2.7	2.1	2.1	2.0	2.0	3.4
4.2	4.3	4.6	4.6	4.8	4.7	4.8	4.5	3.4	2.4	1.9	1.7	1.6	1.5	2.8
4.1	4.5	4.5	4.8	4.9	4.6	4.5	4.1	3.0	2.3	1.8	2.0	1.8	1.7	2.8
4.8	5.1	5.4	5.4	5.2	5.1	4.9	3.8	2.6	2.1	1.8	1.8	1.8	1.9	3.1
4.9	5.2	5.4	5.4	5.4	5.2	4.6	3.6	2.7	2.6	2.5	2.4	2.3	2.2	3.2
5.0	5.4	5.7	5.7	5.7	5.4	4.6	3.7	3.3	3.3	3.1	3.1	3.1	3.1	3.8
4.5	4.9	5.1	5.3	5.4	4.9	4.4	3.6	3.4	3.2	3.3	3.3	3.2	3.3	3.8
5.07	5.38	5.59	5.71	5.75	5.61	5.39	4.68	3.78	3.22	2.93	2.81	2.74	2.69	3.76

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

MEMPHIS, TENN.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	6.9	7.0	7.0	6.8	6.7	6.8	6.6	6.6	6.6	7.1
Feb	6.4	6.8	7.0	6.9	6.9	6.7	6.7	6.7	7.0	7.3
Mar	7.2	6.9	6.9	6.9	6.7	6.6	6.8	6.8	7.6	8.2
Apr	6.2	6.2	6.3	6.1	6.0	6.0	6.1	6.6	7.5	7.6
May	4.9	5.0	5.2	5.0	4.9	4.9	4.9	5.4	6.3	6.8
June	3.8	3.6	3.6	3.5	3.7	3.8	3.9	4.5	5.1	5.1
July	3.5	3.6	3.6	3.6	3.6	3.8	3.7	4.1	4.7	4.8
Aug	3.8	3.9	3.9	3.9	3.9	4.0	4.1	4.4	5.2	5.1
Sept	4.1	4.2	4.0	4.1	4.2	4.3	4.5	4.7	5.5	5.8
Oct	5.2	4.8	5.0	4.8	4.8	4.9	4.9	5.0	5.7	6.4
Nov	6.0	5.6	5.7	5.9	5.9	6.0	6.2	6.2	6.7	7.1
Dec	6.4	6.4	6.4	6.3	6.6	6.7	6.5	6.6	6.9	7.2
Means	5.37	5.33	5.38	5.32	5.32	5.38	5.41	5.63	6.23	6.54

MONTGOMERY, ALA.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	5.7	5.4	5.3	5.4	5.4	5.6	5.6	5.4	5.7	6.3
Feb	6.0	5.6	5.2	4.9	5.0	5.1	5.0	5.2	5.7	6.5
Mar	4.8	4.7	4.6	4.3	4.3	4.4	4.6	5.0	5.9	6.9
Apr	4.5	3.8	3.6	3.3	3.5	3.6	3.7	4.4	5.6	6.5
May	3.4	3.1	3.0	2.9	2.7	2.8	2.9	4.0	5.1	5.6
June	3.1	3.1	3.1	3.1	3.1	3.0	3.2	4.2	5.0	5.3
July	2.9	2.6	2.6	2.7	2.4	2.4	2.6	3.6	4.2	4.7
Aug	2.8	2.7	2.5	2.3	2.2	2.2	2.4	3.2	4.2	4.7
Sept	3.3	3.2	3.0	2.9	2.9	2.8	3.0	3.6	4.8	5.7
Oct	3.4	3.7	3.4	3.3	3.2	3.1	3.3	3.7	4.8	6.0
Nov	3.7	3.4	3.6	3.5	3.6	3.7	3.6	4.2	4.4	5.6
Dec	4.1	4.0	4.0	4.0	4.0	4.2	4.3	4.3	4.7	5.5
Means	3.98	3.78	3.66	3.55	3.52	3.58	3.68	4.23	5.01	5.78

NASHVILLE, TENN.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	7.0	6.7	6.8	6.8	7.0	6.8	6.8	6.9	6.9	7.2
Feb	6.5	6.5	6.4	6.4	6.5	6.5	6.6	6.7	7.1	7.3
Mar	5.9	5.9	6.1	6.1	6.0	6.2	6.1	6.2	7.1	7.8
Apr	5.6	5.3	5.3	5.0	4.9	4.7	5.0	5.6	6.8	7.5
May	4.1	4.1	4.1	4.1	3.9	3.9	4.1	4.6	5.9	7.2
June	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.8	5.6
July	2.6	2.8	2.5	2.4	2.4	2.2	2.3	3.0	4.0	4.9
Aug	2.7	2.7	2.6	2.5	2.4	2.4	2.5	2.8	4.0	4.9
Sept	3.0	2.9	3.0	2.9	2.9	2.8	2.8	3.1	4.0	5.0
Oct	4.6	4.6	4.8	4.6	4.6	4.4	4.6	4.6	5.3	6.1
Nov	5.3	5.3	5.0	4.8	4.7	4.9	4.8	5.0	5.3	6.1
Dec	5.5	5.6	5.4	5.4	5.4	5.3	5.6	5.6	5.7	6.4
Means	4.68	4.62	4.58	4.50	4.48	4.42	4.52	4.82	5.58	6.33

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

MEMPHIS, TENN.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
7.3	7.3	7.1	6.8	6.8	7.0	7.0	6.8	6.1	6.0	6.2	6.8	6.7	7.2	6.8
7.5	7.4	7.7	7.6	7.8	7.5	7.8	7.8	7.1	6.7	6.7	6.5	6.6	6.9	7.1
8.3	7.9	7.8	7.8	7.7	8.1	8.2	7.8	7.0	6.0	6.0	7.0	6.8	7.5	7.2
7.7	7.5	7.9	8.0	8.2	8.2	8.3	8.0	7.7	6.4	5.7	5.9	5.9	7.4	7.0
7.0	7.3	7.6	7.3	7.7	7.5	7.7	7.6	6.9	5.6	5.9	4.5	4.6	5.1	6.1
5.4	5.6	6.0	6.1	6.4	6.3	6.7	6.5	6.9	5.1	4.1	3.9	4.0	4.3	4.9
5.1	5.4	5.7	5.9	6.0	6.1	6.1	6.2	5.5	4.6	3.7	3.7	3.6	3.7	4.7
5.4	5.9	6.2	6.4	6.7	7.2	7.2	7.0	6.8	5.4	4.6	4.4	4.2	4.2	5.2
5.7	6.1	6.5	6.6	6.8	6.9	6.9	6.5	5.6	4.4	4.3	4.4	4.4	4.3	5.2
6.9	7.0	7.1	7.0	7.1	7.1	7.0	6.4	5.5	4.9	4.9	4.9	5.0	5.4	5.7
7.2	7.3	7.1	7.1	7.2	7.0	6.7	6.3	5.8	5.7	5.8	5.8	5.9	6.1	6.3
7.6	7.8	7.7	7.4	7.2	7.0	6.8	6.5	6.1	6.3	6.7	6.8	6.9	6.9	6.8
6.76	6.88	7.03	7.02	7.13	7.16	7.20	6.95	6.42	5.59	5.38	5.38	5.38	5.75	6.09

MONTGOMERY, ALA.

6.8	7.2	7.2	7.4	7.4	7.3	7.2	6.5	5.6	5.5	5.6	5.4	5.6	5.7	6.1
7.0	7.4	7.9	8.2	8.2	8.2	7.9	7.0	6.1	6.3	5.9	6.1	6.0	5.8	6.3
7.6	7.9	8.4	8.7	8.8	8.8	8.5	8.1	6.6	5.6	5.3	5.3	5.3	5.0	6.2
7.2	7.7	8.0	8.3	8.3	8.2	8.0	7.9	6.5	5.8	4.6	4.7	4.6	4.6	5.7
6.0	6.6	7.0	7.3	7.6	7.7	7.5	7.1	6.0	4.3	3.8	3.6	3.7	3.7	4.9
5.8	6.0	6.4	6.7	6.9	7.0	6.9	6.5	5.7	4.3	3.9	3.6	3.4	3.4	4.7
5.0	5.6	5.9	6.2	6.4	6.6	6.7	6.4	5.5	4.1	3.6	3.5	3.4	3.0	4.3
5.1	5.5	5.9	6.1	6.3	6.4	6.3	5.8	4.7	3.5	3.2	3.0	2.8	2.8	4.0
6.1	6.4	6.6	6.6	6.6	6.3	6.2	5.7	4.1	3.9	3.4	3.4	3.3	3.4	4.4
6.5	7.1	7.3	7.3	7.4	7.2	6.9	5.9	4.2	3.9	3.8	3.9	3.7	3.6	4.8
6.3	6.7	7.0	7.3	7.3	7.1	6.6	5.1	4.3	4.1	4.2	4.1	3.9	3.8	4.9
6.0	6.4	6.5	6.6	6.8	6.5	6.0	5.2	4.8	4.7	4.9	4.7	4.8	4.7	5.1
6.28	6.71	7.01	7.22	7.33	7.28	7.06	6.43	5.34	4.67	4.35	4.28	4.21	4.12	5.12

NASHVILLE, TENN.

7.8	8.2	8.4	8.5	8.6	8.7	8.4	8.2	7.6	7.4	7.3	7.2	7.2	7.1	7.5
8.0	8.2	8.6	8.7	8.9	9.0	9.1	8.7	8.1	7.6	7.3	7.0	6.7	6.7	7.5
8.2	8.7	9.1	9.5	9.7	9.9	9.9	9.2	8.2	7.2	6.7	6.4	6.3	6.2	7.4
8.3	8.9	9.6	9.6	9.8	10.1	9.8	9.2	8.6	7.1	6.4	6.1	5.7	5.9	7.1
7.7	8.3	8.9	9.1	9.4	9.5	9.4	8.9	8.0	6.3	5.4	4.9	4.5	4.4	6.3
6.4	7.0	7.3	7.4	7.8	7.7	7.7	7.1	6.5	5.2	4.3	3.9	3.3	3.5	5.0
5.6	6.2	6.5	7.5	7.2	7.1	7.1	7.2	6.4	5.1	3.8	3.3	3.1	2.6	4.5
5.7	6.4	6.9	6.9	7.0	7.2	7.4	7.0	6.3	4.8	4.2	3.6	3.1	3.1	4.6
5.9	6.6	6.9	7.0	7.2	7.3	7.3	7.1	5.8	4.7	4.2	3.8	3.5	3.3	4.7
6.8	7.5	7.9	8.1	8.1	8.2	8.0	7.1	6.3	5.6	5.3	5.0	4.8	4.6	5.9
6.7	7.4	7.9	8.1	8.2	7.9	7.6	6.8	6.4	5.9	5.8	5.7	5.6	5.5	6.1
7.0	7.8	8.0	8.2	8.4	8.2	7.8	6.9	6.3	6.2	6.1	5.9	5.9	6.0	6.4
7.01	7.60	8.00	8.22	8.36	8.40	8.29	7.78	7.04	6.09	5.57	5.23	4.98	4.91	6.08

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

NEW ORLEANS, LA.

Date.	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.
1883 to 1889.										
Jan	8.4	8.5	8.4	8.3	8.3	8.2	8.4	8.2	8.5	8.9
Feb	7.8	7.5	7.3	7.2	7.2	7.1	7.1	7.2	7.6	8.4
Mar	7.0	6.8	6.8	6.6	6.6	6.7	6.7	6.7	7.3	8.5
Apr	6.0	5.8	5.6	5.3	5.1	5.4	5.5	5.8	7.2	9.0
May	5.4	5.1	4.9	4.7	4.4	4.4	4.4	5.2	7.0	8.2
June	4.3	4.1	4.0	3.8	3.6	3.5	3.8	4.7	6.3	7.1
July	4.1	3.9	3.7	3.6	3.5	3.5	3.5	4.1	5.5	6.6
Aug	4.1	3.9	3.8	3.8	3.8	3.8	4.2	4.5	5.9	6.7
Sept	5.3	5.1	4.9	4.8	4.9	5.0	5.4	5.6	6.7	7.9
Oct	6.6	6.2	6.2	6.2	6.2	6.5	6.5	6.6	7.7	8.8
Nov	7.0	6.7	6.5	6.5	6.6	6.6	6.8	6.8	7.3	8.3
Dec	7.5	7.1	6.8	7.0	7.1	7.1	6.9	7.0	7.5	8.1
Means	6.12	5.89	5.74	5.65	5.61	5.65	5.77	6.03	7.04	8.04

NEW YORK CITY, N. Y.

Date.	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.
1883 to 1889.										
Jan	10.4	10.5	10.5	10.3	10.1	10.1	10.3	10.5	10.9	11.3
Feb	10.3	10.1	10.1	10.3	10.7	10.1	10.7	11.0	11.6	12.2
Mar	10.6	10.4	10.2	10.3	9.8	9.8	10.3	10.8	11.4	11.9
Apr	7.8	7.4	7.6	7.4	7.2	7.7	7.9	8.4	9.1	9.3
May	6.9	6.7	6.7	6.4	6.7	6.8	7.1	7.2	7.5	7.6
June	6.9	6.6	6.4	6.4	6.4	6.5	6.7	7.2	7.3	7.6
July	6.1	5.7	5.8	6.0	5.9	5.8	6.4	6.9	7.2	7.4
Aug	6.2	6.2	5.9	5.8	6.0	5.9	6.3	7.0	7.4	7.7
Sept	7.4	6.9	6.7	6.9	6.8	6.9	7.0	7.5	8.0	8.2
Oct	8.1	8.0	8.2	8.5	8.4	8.6	9.0	9.0	9.8	10.3
Nov	9.3	9.1	9.1	8.9	8.9	9.0	9.1	9.2	10.1	10.6
Dec	10.9	10.5	10.5	10.2	10.2	10.3	10.5	10.5	10.7	11.0
Means	8.41	8.18	8.14	8.12	8.09	8.12	8.44	8.77	9.25	9.59

NORTH PLATTE, NEBR.

Date.	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.
1883 to 1889.										
Jan	7.4	7.0	6.8	7.1	7.0	7.0	6.8	6.6	6.7	6.4
Feb	7.3	7.5	7.2	7.2	7.2	7.4	7.3	7.1	7.1	7.3
Mar	7.2	7.6	7.4	7.3	7.1	7.0	7.0	7.3	7.3	8.4
Apr	10.1	9.9	9.5	9.4	8.9	8.8	8.8	8.6	10.2	11.8
May	9.3	9.2	8.8	8.5	8.5	8.5	8.2	8.4	9.8	10.9
June	9.2	9.1	8.4	8.2	8.0	7.6	6.9	6.8	8.3	9.5
July	8.8	8.4	8.3	7.6	7.3	6.7	6.6	6.6	7.2	8.0
Aug	7.5	7.5	7.4	6.8	6.2	5.8	5.7	5.8	6.7	8.2
Sept	9.0	8.5	8.1	7.9	7.5	7.1	6.7	6.5	7.1	9.0
Oct	7.5	7.5	7.4	6.9	6.6	6.5	6.7	6.5	6.5	7.3
Nov	6.5	6.4	6.6	6.4	6.4	6.3	6.2	6.4	6.5	6.4
Dec	6.6	6.4	6.2	6.1	6.1	5.9	6.0	6.0	6.0	6.1
Means	8.03	7.92	7.68	7.45	7.23	7.05	6.91	6.88	7.45	8.28

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

NEW ORLEANS, LA.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
9.2	9.7	10.1	10.0	10.4	10.3	10.0	9.2	8.3	8.0	8.0	7.8	8.2	8.4	8.8
9.1	9.4	9.8	10.0	10.5	10.2	10.2	9.5	8.4	7.7	7.8	7.9	7.9	8.0	8.4
9.4	10.0	10.2	10.3	10.5	10.4	10.1	9.7	8.7	7.7	7.4	7.2	7.4	7.2	8.2
9.6	9.7	9.9	9.9	10.1	10.0	10.1	9.9	9.1	7.5	7.0	6.8	6.6	6.3	7.6
8.9	8.9	9.2	9.2	9.6	9.3	9.2	8.8	8.3	6.9	6.2	6.0	5.7	5.5	6.9
7.7	8.1	8.6	8.7	8.7	8.7	9.0	8.7	7.9	6.5	5.6	5.1	4.7	4.7	6.2
7.1	7.3	7.3	7.6	7.4	7.7	7.7	7.2	6.6	5.5	4.8	4.3	4.1	4.1	5.5
7.3	7.6	8.0	8.4	8.3	8.1	7.9	7.3	6.4	5.3	4.6	4.6	4.4	4.2	5.7
8.4	8.9	9.0	9.2	9.1	9.0	8.6	8.1	7.1	6.0	5.8	5.6	5.2	5.3	6.7
9.6	9.5	9.5	9.7	9.2	9.4	9.1	8.2	6.9	6.1	6.2	6.2	6.3	6.4	7.5
8.9	9.3	9.6	9.5	9.4	9.4	9.3	8.3	7.0	6.8	6.9	6.8	6.8	6.9	7.7
8.8	9.4	9.9	9.8	9.8	9.7	9.5	8.5	7.8	7.6	7.8	8.0	8.0	7.6	8.1
8.67	8.98	9.26	9.36	9.42	9.35	9.22	8.62	7.71	6.80	6.51	6.36	6.28	6.22	7.26

NEW YORK CITY, N. Y.

11.6	11.9	11.9	12.2	12.2	12.3	11.8	11.5	10.7	10.9	10.9	10.6	10.7	10.5	11.0
12.5	12.5	12.6	13.4	12.8	12.7	12.3	11.7	11.4	11.4	11.3	10.9	10.9	10.7	11.4
12.5	12.7	12.8	13.0	13.0	13.2	12.9	12.8	12.2	11.5	11.4	11.3	11.0	10.7	11.6
9.5	10.1	10.4	10.5	11.2	11.0	10.7	10.2	9.5	8.9	8.4	7.9	7.8	7.7	8.9
8.4	8.8	9.4	9.6	9.8	9.8	9.8	9.2	8.4	7.8	7.7	7.2	7.1	6.9	7.9
7.8	8.5	9.0	9.4	9.6	9.5	9.4	9.0	8.5	8.0	7.5	7.3	7.0	6.7	7.7
8.0	8.2	8.7	8.9	9.4	9.4	9.4	9.0	8.1	7.3	7.1	7.0	6.7	6.7	7.4
8.0	8.1	8.9	9.2	9.4	9.4	8.9	8.4	7.6	7.0	6.8	6.6	6.3	6.0	7.3
8.6	8.9	9.3	9.5	9.5	9.5	9.4	8.8	8.0	7.9	8.0	7.6	7.5	7.7	8.0
10.6	10.9	11.3	11.2	11.2	10.9	10.6	9.7	9.4	9.3	9.2	8.7	8.7	8.2	9.5
11.1	11.3	11.4	11.7	11.9	11.6	10.8	10.5	10.4	10.1	9.8	9.7	9.9	9.7	10.1
11.4	11.5	12.0	11.9	11.7	11.4	10.8	10.8	11.0	10.8	10.7	10.8	10.7	10.7	10.9
10.00	10.28	10.64	10.88	10.98	10.89	10.57	10.13	9.60	9.24	9.07	8.80	8.69	8.52	9.30

NORTH PLATTE, NEBR.

7.0	7.9	9.3	9.7	10.1	10.1	9.8	8.9	8.1	7.4	7.2	7.1	7.1	7.1	7.7
8.2	9.2	10.2	10.7	11.1	11.4	11.2	10.4	9.3	8.2	7.7	7.4	7.5	7.4	8.4
9.7	10.8	11.3	11.4	11.6	12.1	12.2	11.7	10.6	9.1	8.2	7.7	7.7	7.4	9.0
13.3	14.4	15.2	15.3	15.4	15.4	15.0	14.6	14.0	12.5	10.7	10.4	10.8	10.5	11.8
11.9	12.8	12.8	12.5	12.6	12.7	13.3	12.9	12.8	12.0	10.7	9.7	9.9	9.5	10.7
10.4	11.0	11.5	12.0	12.3	12.4	12.5	12.9	12.7	12.4	11.2	9.6	9.4	9.5	10.0
9.0	9.6	10.1	10.7	10.9	11.0	11.4	11.4	11.3	10.7	9.9	8.9	8.9	8.6	9.1
9.1	9.5	9.8	10.1	10.8	10.7	11.0	11.2	11.0	9.9	9.0	8.5	8.1	8.1	8.5
10.4	11.2	11.5	11.8	12.2	12.4	12.3	12.5	11.4	9.8	9.1	9.0	9.2	9.2	9.6
9.2	10.8	11.6	12.1	12.5	12.5	12.4	11.7	9.9	8.4	8.3	8.2	8.2	7.8	8.9
7.5	8.7	9.8	10.7	11.1	11.4	11.1	9.4	7.4	6.7	6.7	6.2	6.4	6.4	7.6
6.5	7.7	8.5	9.3	9.6	9.7	9.3	8.1	7.4	7.2	7.0	6.9	6.9	6.6	7.2
9.35	10.30	10.96	11.36	11.68	11.82	11.79	11.31	10.49	9.52	8.81	8.30	8.34	8.18	9.04

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

OMAHA, NEBR.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	8.5	8.4	8.3	8.1	7.8	7.9	8.0	7.8	8.1	8.4
Feb	8.2	8.2	8.4	8.2	8.2	8.1	7.9	8.0	8.1	8.5
Mar	7.8	7.7	7.8	7.5	7.6	7.4	7.7	7.8	8.2	9.0
Apr	8.0	8.1	8.0	7.9	7.7	7.5	7.6	7.9	9.0	10.0
May	6.5	6.3	6.4	6.3	6.3	6.2	6.2	6.6	7.8	9.0
June	5.4	5.4	5.3	4.9	4.9	4.6	4.8	5.6	6.6	7.3
July	5.6	5.4	5.3	5.1	4.6	4.5	4.3	4.6	5.7	6.6
Aug	5.2	5.2	5.0	4.6	4.6	4.6	4.6	5.1	5.9	6.6
Sept	6.5	6.1	5.8	5.8	5.6	5.6	5.7	5.9	6.8	7.8
Oct	6.9	6.6	6.4	6.2	6.1	6.0	6.0	5.9	6.6	7.6
Nov	7.7	7.6	7.6	7.3	7.1	7.2	7.2	7.2	7.5	8.5
Dec	8.2	8.2	8.4	8.1	8.2	8.1	8.2	8.2	8.2	8.4
Means	7.04	6.93	6.89	6.67	6.56	6.48	6.52	6.71	7.38	8.14

PALESTINE, TEX.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	9.0	9.2	9.1	9.3	9.2	9.1	8.9	8.9	8.8	9.1
Feb	9.7	9.6	9.5	9.6	9.7	9.7	9.4	9.2	9.2	9.6
Mar	9.2	9.3	9.3	8.9	9.1	9.2	8.9	8.9	9.1	9.8
Apr	9.3	9.2	9.1	8.6	8.2	8.2	8.1	8.3	9.0	9.9
May	8.3	8.1	8.0	7.6	7.4	7.2	7.0	6.9	7.3	8.4
June	6.6	6.5	6.3	6.0	6.0	5.7	5.3	5.3	6.2	7.2
July	6.7	6.6	6.5	6.3	6.3	6.2	5.9	6.0	7.3	7.9
Aug	6.8	6.8	6.3	6.0	6.0	5.9	5.8	5.7	6.4	7.5
Sept	7.4	7.2	7.0	6.9	6.8	6.6	6.5	6.4	6.4	7.3
Oct	7.6	7.2	7.0	7.0	6.8	7.2	6.8	6.8	7.0	7.8
Nov	8.0	7.7	7.7	7.6	7.7	7.4	7.4	7.5	7.5	7.8
Dec	8.5	8.5	8.7	8.7	8.7	8.8	8.3	8.2	8.4	8.7
Means	8.09	7.99	7.88	7.71	7.66	7.60	7.36	7.34	7.72	8.42

PHILADELPHIA, PA.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	9.8	9.5	9.4	9.3	9.4	9.4	9.4	9.6	10.4	11.2
Feb	9.3	9.3	9.5	9.7	9.8	9.8	9.6	10.0	10.8	11.4
Mar	10.2	10.0	9.9	9.9	10.0	9.9	10.3	10.9	12.3	13.1
Apr	9.0	9.2	8.7	8.7	8.7	9.0	9.7	10.8	11.4	12.3
May	7.4	7.4	7.3	7.2	7.0	7.3	7.9	8.7	9.2	9.4
June	7.2	7.1	7.1	7.1	7.1	7.7	8.2	8.9	9.7	9.7
July	6.6	6.6	6.6	6.6	6.6	6.7	7.5	8.2	8.7	8.8
Aug	6.3	6.3	6.3	6.4	6.2	6.4	6.9	7.9	8.5	9.1
Sept	8.0	7.7	7.6	7.6	7.8	7.7	8.1	8.9	9.9	10.3
Oct	7.9	7.9	8.0	8.1	8.2	8.2	8.4	8.9	10.0	10.8
Nov	9.0	8.8	8.7	8.8	9.0	8.8	8.8	9.3	10.3	11.6
Dec	9.9	9.6	9.8	9.6	9.6	9.8	9.6	9.6	10.2	11.0
Means	8.38	8.28	8.24	8.25	8.28	8.39	8.70	9.31	10.12	10.72

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

OMAHA, NEBR.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
9.2	9.7	10.1	10.6	10.8	10.8	10.3	9.5	8.6	8.4	8.6	8.7	8.9	8.5	8.9
9.2	9.6	10.1	10.4	10.8	10.7	10.5	9.9	9.0	8.3	8.2	8.1	8.2	8.2	8.9
9.5	9.8	10.3	10.5	10.7	10.9	10.7	10.1	9.7	8.4	7.9	8.0	8.2	7.8	8.8
10.6	11.3	11.9	12.4	12.8	12.6	12.6	11.8	10.8	9.5	8.4	8.4	8.2	8.2	9.6
10.0	10.6	11.0	11.2	11.5	11.4	11.4	11.1	10.3	8.9	7.4	6.7	6.8	6.6	8.4
7.8	8.5	8.9	9.3	9.2	9.2	9.2	8.8	8.1	7.3	6.1	5.5	5.6	5.5	6.8
7.2	7.6	8.0	8.2	8.7	8.8	8.5	8.1	7.2	6.3	5.5	5.1	5.4	5.4	6.3
7.1	8.0	8.4	8.5	8.6	8.5	8.2	7.9	6.9	5.7	5.1	5.1	5.2	5.4	6.3
8.5	9.3	10.0	10.3	10.4	10.5	9.9	9.0	7.6	6.2	6.2	6.2	6.4	6.4	7.4
8.9	9.6	9.9	10.6	11.0	10.9	10.3	9.1	7.4	6.7	6.9	6.9	7.1	7.1	7.8
9.5	9.9	10.3	10.5	10.8	10.7	10.2	8.9	8.2	8.0	8.1	8.0	8.0	7.7	8.5
9.0	9.6	10.0	10.4	10.3	10.3	9.7	8.6	8.4	8.5	8.8	8.6	8.4	8.3	8.8
8.88	9.46	9.91	10.24	10.47	10.44	10.12	9.40	8.52	7.68	7.27	7.11	7.20	7.09	8.05

PALESTINE, TEX.

9.7	10.4	10.7	10.9	10.9	11.1	11.1	10.5	9.2	8.6	8.5	8.6	9.3	9.3	9.6
10.6	11.2	11.6	11.8	12.0	12.0	12.0	11.4	10.4	9.0	8.7	9.1	9.6	9.9	10.2
10.8	11.4	11.1	11.2	11.2	11.2	11.0	11.1	10.4	9.1	8.4	8.7	9.1	9.4	9.8
10.5	11.0	11.2	11.1	11.3	11.3	11.3	10.6	9.9	8.5	8.0	8.4	9.0	9.3	9.6
9.3	9.8	9.8	9.7	9.8	9.8	9.7	9.4	8.4	6.9	6.4	6.9	7.4	8.2	8.2
7.3	7.4	7.3	7.6	7.9	7.7	7.9	8.0	7.0	5.9	5.6	5.8	6.4	6.8	6.7
8.0	8.0	7.9	7.7	8.1	8.0	7.8	7.5	6.8	5.5	5.3	5.7	6.1	6.7	6.9
7.8	7.6	7.6	7.5	7.8	7.8	7.9	8.2	7.5	6.2	5.7	6.0	6.4	6.7	6.8
8.1	8.5	8.2	8.3	8.5	8.6	8.6	8.4	7.3	6.2	6.3	6.8	7.2	7.7	7.4
8.8	9.2	9.1	9.1	9.1	8.8	9.0	8.4	6.8	6.3	6.8	7.1	7.5	7.7	7.7
8.7	9.4	9.4	9.3	9.4	9.5	9.2	8.5	7.2	6.9	7.4	7.9	8.1	8.1	8.1
9.7	10.2	10.3	10.1	10.3	10.3	9.8	9.5	8.0	7.5	8.1	8.3	8.5	8.7	9.0
9.11	9.51	9.52	9.52	9.69	9.68	9.61	9.29	8.24	7.22	7.10	7.44	7.88	8.21	8.32

PHILADELPHIA, PA.

12.0	12.3	12.8	12.4	12.3	12.0	11.1	10.4	10.4	10.3	10.2	10.2	10.0	9.9	10.6
11.8	11.9	12.5	12.5	12.4	12.3	11.9	10.8	10.0	9.4	9.5	9.5	9.4	9.6	10.5
13.5	13.5	13.8	14.0	14.2	14.2	13.4	12.1	11.2	10.7	10.7	10.8	10.6	10.4	11.7
12.5	12.8	13.0	13.1	13.0	12.9	12.6	11.9	10.5	9.6	9.1	9.2	9.0	9.0	10.6
9.8	10.2	10.7	10.9	10.7	10.8	10.7	10.4	9.2	8.4	7.9	7.9	7.6	7.7	8.8
10.1	10.4	10.7	11.2	11.6	11.6	11.2	10.7	9.7	8.6	8.2	8.0	7.6	7.4	9.0
9.0	9.6	10.0	10.4	11.3	10.6	10.3	9.8	8.7	7.6	7.3	6.8	6.7	6.6	8.2
9.0	9.4	10.0	10.3	10.6	10.6	9.9	9.2	8.0	7.0	6.6	6.3	6.1	6.1	7.9
10.4	10.7	11.0	10.9	11.0	10.9	10.3	9.3	8.4	8.1	8.0	8.0	7.8	8.1	9.0
11.2	11.6	11.7	11.5	11.7	11.7	10.7	9.3	8.9	8.3	8.1	8.4	8.4	8.1	9.5
12.2	12.3	12.5	12.4	12.2	11.8	10.2	9.5	9.5	9.4	9.5	9.4	9.5	9.4	10.1
11.7	12.0	12.1	12.2	11.9	11.4	10.7	10.2	10.2	10.2	10.1	9.9	9.9	9.7	10.4
11.10	11.39	11.73	11.82	11.91	11.73	11.08	10.30	9.56	8.97	8.77	8.70	8.55	8.50	9.71

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

PHŒNIX, ARIZ.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1879 to 1881.										
Jan.*	2.2	2.5	2.4	2.3	2.0	2.2	2.7	2.7	2.8	2.8
Feb.*	2.3	2.2	2.2	2.3	2.2	2.4	2.4	2.9	3.2	3.6
Mar.	1.8	1.9	1.9	1.9	1.9	2.3	2.7	2.8	3.0	3.2
Apr.	2.0	2.0	2.0	2.0	2.1	2.9	3.0	3.3	3.5	4.0
May	1.8	2.0	2.0	1.8	1.9	1.9	2.1	2.0	2.6	3.2
June	1.5	1.8	1.9	2.0	2.1	2.4	2.3	2.2	2.6	3.0
July	1.7	1.7	1.7	1.8	2.0	2.2	2.5	2.3	2.7	3.1
Aug.*	1.8	1.6	1.4	1.5	1.4	1.9	2.2	2.2	2.6	2.7
Sept	1.3	1.5	1.7	1.5	1.6	1.9	2.4	2.5	2.3	2.1
Oct	1.5	1.5	1.5	1.5	1.6	1.7	2.2	2.5	2.5	2.9
Nov	1.6	1.7	1.6	1.7	1.4	1.6	2.1	2.5	2.9	2.9
Dec	1.9	1.9	1.9	2.0	1.8	2.0	2.2	2.7	2.5	2.8
Means	1.78	1.86	1.85	1.86	1.83	2.12	2.40	2.55	2.77	3.02

PITTSBURGH, PA.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	6.7	6.5	6.7	6.8	6.8	6.8	7.2	7.3	7.7	8.0
Feb	7.2	6.8	7.0	6.9	7.1	7.5	7.2	7.2	7.6	8.0
Mar	6.2	6.0	6.0	6.1	6.0	6.1	6.2	6.6	7.5	8.0
Apr	4.6	4.4	4.5	4.6	4.6	4.7	5.0	5.6	6.4	7.0
May	3.9	4.1	4.0	4.1	4.0	4.1	4.2	4.9	5.8	6.4
June	3.8	3.5	3.8	3.6	3.5	3.6	4.1	4.8	5.7	6.3
July	3.1	3.0	2.8	2.9	2.9	2.9	3.0	3.8	4.1	5.3
Aug.†	3.1	2.9	3.0	3.1	3.0	3.0	3.2	3.6	4.4	5.2
Sept	3.4	3.3	3.2	3.2	3.3	3.4	3.4	3.8	4.5	5.5
Oct	4.1	4.0	3.9	3.9	4.0	4.2	4.2	4.5	5.2	5.8
Nov	5.7	5.9	5.9	5.7	5.9	6.1	6.1	6.3	6.8	7.1
Dec	6.2	5.9	6.0	6.1	6.2	6.2	6.3	6.5	6.8	7.1
Means	4.83	4.69	4.73	4.75	4.78	4.88	5.01	5.41	6.04	6.64

PORTLAND, OREGON.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	4.9	5.0	5.0	4.9	5.0	4.8	4.8	4.9	4.8	4.7
Feb	4.1	3.9	3.8	3.7	3.8	3.9	3.9	3.7	4.0	3.7
Mar	4.2	4.1	3.9	3.7	3.7	3.6	3.4	3.6	3.7	3.9
Apr	4.7	4.5	4.2	3.8	3.9	3.8	3.6	3.4	3.5	3.8
May	5.3	4.8	4.4	3.9	3.9	3.6	3.5	3.1	3.5	4.4
June	5.5	4.8	4.1	3.7	3.2	3.2	3.0	2.7	3.1	4.1
July	5.4	5.0	4.1	3.6	3.2	2.8	2.8	2.5	2.7	3.6
Aug	4.6	3.6	3.1	2.4	2.3	2.2	2.1	2.0	2.0	2.4
Sept	4.6	4.1	3.8	3.7	3.5	3.5	3.3	3.2	2.3	3.5
Oct	3.5	3.6	3.3	3.3	3.5	3.6	3.5	3.4	3.7	3.6
Nov	4.3	4.3	4.1	4.2	4.4	4.2	4.2	4.1	4.1	3.5
Dec	4.6	4.4	4.6	4.8	4.9	4.9	5.0	4.8	4.9	4.8
Means	4.64	4.34	4.03	3.81	3.78	3.68	3.59	3.45	3.61	3.83

* Two years. † Six years.

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

PHŒNIX, ARIZ.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
2.8	2.8	3.0	2.9	2.4	1.5	1.6	1.6	1.6	1.8	1.8	2.0	2.0	1.9	2.2
4.0	4.5	4.6	4.4	4.2	3.0	2.5	2.6	2.0	2.0	2.0	2.2	2.2	2.1	2.8
3.3	3.6	4.0	4.0	3.6	2.6	1.8	1.4	1.3	1.7	1.4	1.6	1.7	1.6	2.4
4.4	5.1	5.3	5.7	5.4	4.7	2.7	2.5	2.3	2.0	2.1	2.1	1.8	2.0	3.1
3.6	4.4	5.0	5.3	5.1	4.4	2.4	1.9	1.8	1.4	1.4	1.3	1.2	1.5	2.6
3.5	4.3	4.9	5.3	5.3	5.0	3.0	2.1	2.0	1.6	1.6	1.3	1.4	1.4	2.7
3.4	3.9	4.1	4.3	4.4	4.2	3.1	2.6	3.0	2.9	2.3	2.1	2.0	2.1	2.8
3.2	3.3	3.6	3.4	3.3	3.2	2.2	2.0	2.2	1.9	2.0	2.0	1.8	1,7	2.3
2.3	2.8	2.8	2.7	2.3	1.4	1.1	1.2	1.0	1.0	1.0	1.0	1.2	1.4	1.7
2.8	3.0	3.1	2.9	2.2	1.3	1.0	1.0	1.0	1.1	1.4	1.7	1.5	1.5	1.9
3.3	3.1	3.1	2.8	1.7	1.3	1.0	0.9	1.1	1.5	1.6	1.8	1.6	1.7	1.9
2.6	2.8	2.7	2.3	1.4	1.1	1.1	1.0	1.1	1.4	1.6	1.6	1.7	1.8	1.9
3.27	3.63	3.85	3.83	3.44	2.81	1.96	1.73	1.70	1.69	1.68	1.72	1.68	1.72	2.37

PITTSBURGH, PA.

8.3	8.5	8.9	9.0	8.8	8.6	8.3	8.0	7.5	7.5	7.5	7.3	6.8	6.9	7.6
8.2	8.4	8.8	8.9	9.0	8.7	8.4	7.6	7.3	7.2	7.3	6.9	7.0	7.1	7.6
8.1	8.5	9.0	9.1	9.1	8.9	8.6	8.4	7.2	6.8	6.5	6.6	6.5	6.4	7.2
7.5	8.1	8.2	8.4	8.5	8.2	8.0	7.6	6.8	6.0	5.6	5.3	5.0	5.4	6.2
7.0	7.6	7.7	7.9	7.9	7.8	7.7	7.3	6.4	5.7	4.9	4.4	4.3	4.1	5.7
6.8	7.4	7.5	7.6	7.6	7.5	7.4	6.8	6.0	5.1	4.5	4.0	3.9	4.0	5.4
5.9	6.5	6.8	7.1	7.2	7.3	7.2	6.8	6.2	4.9	4.0	3.4	3.3	3.4	4.7
5.8	6.5	6.5	6.6	6.6	6.8	6.5	6.2	5.4	4.2	3.7	3.3	3.1	3.0	4.5
6.4	7.0	7.1	7.0	7.1	6.9	6.7	6.2	5.2	4.6	4.2	4.0	3.9	3.6	4.9
6.3	7.0	7.2	7.3	7.5	7.1	7.0	5.9	5.4	4.9	4.5	4.5	4.4	4.3	5.3
7.6	8.1	8.0	8.1	8.4	8.1	7.6	7.1	6.7	6.4	6.2	5.8	5.9	6.0	6.7
7.3	7.9	8.2	8.1	8.1	7.8	7.5	7.3	7.2	6.8	6.6	6.3	6.2	6.4	6.9
7.10	7.62	7.82	7.92	7.98	7.81	7.58	7.10	6.44	5.84	5.46	5.15	5.02	5.05	6.07

PORTLAND, OREGON.

4.9	5.2	5.5	5.9	6.1	6.2	6.1	6.1	5.7	5.4	5.1	4.9	4.9	4.8	5.2
4.0	4.4	5.0	5.4	5.8	6.4	6.6	6.5	6.4	6.0	5.1	4.5	4.3	4.1	4.7
4.4	5.3	5.7	6.3	6.4	6.4	6.8	7.2	7.1	6.7	5.8	4.7	4.4	4.2	5.0
4.7	5.6	6.2	6.5	6.6	6.6	6.8	7.1	7.4	7.4	6.7	5.6	5.0	4.7	5.3
5.4	5.8	6.0	6.3	6.8	7.0	7.1	7.2	7.2	7.2	7.2	7.0	6.2	5.5	5.5
5.0	5.6	5.8	5.8	6.0	6.2	6.4	6.6	7.2	7.3	7.3	6.9	6.2	5.8	5.2
4.8	5.4	5.5	5.6	6.1	6.1	6.4	6.6	7.0	7.2	7.4	6.9	5.9	5.6	5.1
3.3	4.4	5.2	5.5	5.8	6.0	6.3	6.4	6.8	7.3	7.1	6.2	5.3	5.1	4.5
4.0	4.9	5.7	6.2	6.4	6.6	6.8	7.0	6.9	6.5	5.9	5.0	4.8	4.7	4.9
4.0	4.6	5.1	5.4	5.9	5.7	5.4	5.4	5.2	4.5	3.9	3.6	3.4	3.5	4.2
4.1	4.2	4.9	5.2	5.6	5.7	5.6	5.6	5.2	4.4	4.3	4.2	4.2	4.1	4.5
4.9	5.1	5.3	6.0	6.3	6.1	6.1	6.1	5.8	5.1	5.1	5.0	4.9	4.9	5.2
4.47	5.04	5.49	5.84	6.15	6.25	6.37	6.48	6.49	6.25	5.91	5.38	4.96	4.75	4.94

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

RED BLUFF, CAL.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	5.7	5.7	6.0	5.9	5.9	5.9	6.2	6.0	6.0	5.9
Feb	5.8	6.1	6.6	6.5	6.6	6.3	6.4	6.2	6.2	6.2
Mar	6.3	6.2	6.1	6.3	6.4	6.6	6.5	6.2	6.2	6.3
Apr	6.6	6.4	6.1	6.1	6.4	6.4	6.3	6.2	6.2	6.5
May	6.4	6.5	6.1	5.8	5.9	5.9	5.7	5.4	5.2	6.1
June	7.6	7.3	6.6	5.9	5.6	5.2	5.1	5.2	5.1	6.2
July	5.9	5.9	5.9	5.0	4.3	4.3	3.9	3.6	3.6	4.1
Aug	4.6	4.6	4.3	4.0	4.0	3.7	3.6	3.4	3.3	3.1
Sept	5.5	5.6	5.8	5.6	5.7	5.4	5.5	5.5	5.3	5.2
Oct	5.5	5.4	5.4	5.6	5.7	5.6	5.6	5.7	5.6	5.5
Nov	5.5	5.4	5.6	5.4	5.6	5.8	5.8	5.5	5.8	5.9
Dec	5.7	6.0	6.0	6.0	6.2	6.2	6.5	6.4	6.6	6.9
Means	5.92	5.92	5.88	5.68	5.69	5.61	5.59	5.44	5.42	5.66

RIO GRANDE CITY, TEX.

1884 to 1889.										
Jan	5.3	5.1	5.1	4.9	4.9	4.8	4.6	4.5	4.6	5.0
Feb	5.6	5.3	5.3	5.0	4.7	4.8	5.0	4.7	4.4	4.9
Mar	6.3	5.6	5.3	4.8	4.6	4.6	4.6	4.5	4.7	5.7
Apr	7.9	7.3	6.7	6.3	5.9	5.9	5.6	5.5	6.6	8.3
May	7.9	6.4	6.2	5.7	5.6	5.4	5.2	5.3	6.2	7.5
June	6.6	5.5	4.7	4.3	4.1	4.2	4.2	4.7	6.2	7.2
July	8.0	6.9	6.2	5.6	5.1	5.2	4.8	5.0	6.8	7.8
Aug	6.4	5.3	4.5	3.9	3.7	3.6	3.6	3.5	5.0	6.3
Sept	4.5	4.0	3.9	3.7	3.6	3.4	3.6	3.5	4.0	5.7
Oct	3.6	3.3	3.0	3.0	3.1	3.2	3.1	2.9	3.3	4.4
Nov	4.3	4.1	4.0	3.8	3.8	4.2	4.0	3.8	4.0	4.7
Dec	4.7	4.2	4.1	4.0	3.8	4.0	3.9	3.7	3.4	4.2
Means	5.92	5.25	4.92	4.58	4.41	4.44	4.35	4.30	4.93	5.98

ROCHESTER, N. Y.

1884 to 1889.										
Jan	13.7	13.4	13.4	13.4	13.9	13.9	13.9	13.8	13.8	14.2
Feb	12.2	12.1	12.3	12.3	12.1	11.7	11.8	12.0	13.0	12.9
Mar	10.7	10.7	10.6	10.8	10.9	10.9	11.0	11.5	12.4	12.8
Apr	9.9	9.9	9.7	9.8	10.1	9.9	9.8	10.1	10.9	11.8
May	9.4	9.6	9.7	9.3	9.0	9.0	9.0	9.4	9.8	10.2
June	8.6	8.7	8.9	8.7	8.8	8.9	8.7	8.6	9.0	9.1
July	7.4	7.5	7.5	7.5	7.6	7.4	7.6	7.9	8.1	8.4
Aug	7.3	7.3	7.2	7.3	7.3	7.2	7.1	7.2	7.6	8.0
Sept	8.9	9.1	9.1	9.0	9.1	8.7	8.5	8.8	8.9	9.5
Oct	10.1	10.1	10.2	10.2	10.0	10.1	10.0	10.0	10.5	11.0
Nov	10.4	11.2	11.5	11.3	11.4	11.6	11.4	11.4	11.9	12.5
Dec	12.0	11.8	11.8	11.8	11.9	11.9	11.5	11.7	12.0	12.2
Means	10.05	10.12	10.16	10.12	10.18	10.10	10.02	10.20	10.66	11.05

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

RED BLUFF, CAL.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
6.1	6.1	6.7	7.4	7.9	8.2	8.4	8.1	8.0	7.1	6.4	6.1	5.9	6.3	6.6
6.2	6.2	7.6	7.9	8.6	8.4	8.1	7.9	7.9	7.4	6.4	6.0	6.0	5.7	6.8
6.7	7.7	8.7	9.0	8.7	8.5	8.7	8.9	9.2	9.1	8.1	7.2	6.9	6.4	7.4
7.8	9.2	9.6	9.4	9.5	9.4	9.5	9.7	9.4	9.2	8.6	7.6	7.2	6.9	7.7
7.5	8.3	8.4	8.4	8.1	8.1	8.3	8.4	8.7	8.8	8.8	8.1	7.6	7.7	7.3
7.3	7.5	7.3	7.0	7.4	7.8	8.1	8.5	8.7	9.0	9.4	8.9	8.3	7.4	7.2
5.1	5.4	5.5	5.3	5.7	6.3	7.0	7.5	7.6	7.8	8.0	7.9	7.1	5.9	5.8
3.8	4.6	4.7	4.6	4.7	5.4	6.2	6.6	6.8	6.9	6.8	6.1	5.4	5.3	4.9
7.1	7.0	7.6	7.2	6.9	6.9	7.2	7.0	7.0	6.9	6.3	5.6	5.3	4.7	6.1
5.6	6.3	7.4	7.6	7.4	7.4	7.6	7.6	6.1	6.6	5.6	5.5	5.1	6.1	6.2
5.9	6.2	7.0	7.2	7.4	7.3	7.2	6.9	6.3	5.6	5.2	5.0	5.1	5.7	6.0
6.8	6.9	7.5	8.1	8.4	8.5	8.4	8.0	7.3	6.7	6.4	6.1	6.0	5.2	6.8
6.32	6.78	7.33	7.42	7.56	7.68	7.89	7.92	7.75	7.59	7.17	6.68	6.32	6.11	6.55

RIO GRANDE CITY, TEX.

5.9	6.9	7.4	7.6	7.9	8.1	8.2	8.0	7.4	5.9	5.6	5.7	5.4	5.4	6.0
6.2	7.5	8.2	8.4	8.4	8.3	8.2	8.3	7.9	7.0	6.8	7.0	6.9	6.3	6.5
6.8	7.6	7.9	8.1	8.4	8.4	8.7	9.0	8.9	8.3	7.4	7.5	7.2	6.9	6.7
8.9	9.1	9.3	9.4	9.8	9.8	10.0	10.5	10.7	10.3	10.0	9.8	9.5	8.7	8.4
7.9	8.1	8.3	8.1	8.4	8.5	9.1	9.7	9.8	9.5	9.1	8.9	8.4	7.9	7.6
7.5	7.7	7.9	7.9	8.3	8.7	9.0	9.5	9.8	9.6	9.0	8.7	8.0	7.7	7.1
8.5	9.1	9.3	9.4	9.7	10.0	10.6	11.3	11.7	11.2	10.6	10.2	9.8	9.2	8.4
7.2	7.6	7.8	8.1	8.6	9.0	9.8	10.9	11.4	11.1	10.3	9.7	8.8	7.8	7.2
6.7	7.2	7.3	7.7	8.3	8.5	8.6	8.6	8.5	7.7	6.8	6.4	5.8	5.0	6.0
5.3	6.1	6.4	6.7	6.9	7.0	7.1	7.1	6.5	5.4	5.3	5.6	4.9	4.2	4.9
5.7	6.6	7.0	7.2	7.6	7.6	7.4	7.1	5.9	4.9	5.2	5.0	4.7	4.5	5.3
5.7	6.8	7.6	8.1	8.1	7.8	7.9	7.5	6.4	5.3	5.9	6.1	5.6	5.0	5.6
6.86	7.52	7.87	8.06	8.37	8.48	8.72	8.96	8.74	8.02	7.67	7.55	7.08	6.55	6.64

ROCHESTER, N. Y.

14.6	14.7	15.3	15.0	14.7	14.3	13.4	12.8	12.9	13.0	13.0	13.1	13.5	13.5	13.8
13.4	13.3	13.9	13.9	14.0	13.7	13.2	12.7	12.5	12.7	12.7	12.8	12.2	12.0	12.7
13.3	13.8	14.1	14.1	14.3	14.2	14.2	12.8	12.0	11.3	11.4	11.4	11.3	11.0	12.2
12.3	12.7	13.4	13.3	14.4	13.9	13.2	12.1	10.3	9.2	9.2	9.8	9.9	9.9	11.2
10.9	11.4	11.9	12.0	12.0	11.9	11.4	10.2	9.0	8.6	8.7	9.0	9.3	9.4	10.0
9.4	9.8	10.1	10.6	10.9	10.4	10.0	8.9	7.6	6.4	6.5	7.4	7.9	8.2	8.8
8.8	9.1	9.7	9.9	9.8	9.6	8.8	7.9	6.9	6.3	6.5	6.9	7.1	7.4	8.0
8.6	9.0	9.1	9.7	9.8	9.7	9.3	8.2	6.9	6.4	6.6	6.8	7.1	7.2	7.9
9.8	10.1	10.8	11.2	11.2	10.9	10.2	8.9	7.7	8.0	8.5	8.8	9.1	9.0	9.4
11.4	11.4	11.8	11.9	11.7	11.5	10.4	9.2	9.0	9.2	9.6	10.0	10.1	10.1	10.4
13.2	13.4	13.4	13.3	12.8	12.0	11.0	10.8	10.7	11.3	11.3	11.1	11.1	10.9	11.8
12.9	13.1	13.5	13.0	13.0	12.4	11.8	12.0	12.6	12.3	12.4	12.4	12.3	12.0	12.1
11.55	11.82	12.25	12.32	12.38	12.04	11.41	10.54	9.84	9.56	9.70	9.96	10.08	10.05	10.68

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

ROSEBURGH, OREGON.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan.*	2.4	2.4	2.3	2.4	2.3	2.3	2.4	2.3	2.3	2.5
Feb	1.8	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.8	1.7
Mar	1.9	1.8	1.8	1.7	1.7	1.8	1.8	1.8	1.7	1.8
Apr	2.3	1.9	1.8	1.7	1.6	1.6	1.7	1.5	1.4	1.6
May	2.0	1.6	1.5	1.5	1.4	1.4	1.3	1.2	1.2	1.4
June	2.4	1.7	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.4
July	2.2	1.6	1.3	1.2	1.1	1.2	1.1	1.1	1.1	1.4
Aug	1.9	1.2	1.0	1.0	1.0	1.1	1.0	1.0	0.9	1.0
Sept.*	1.6	1.5	1.5	1.4	1.3	1.2	1.2	1.2	1.1	1.2
Oct.*	1.5	1.3	1.3	1.3	1.3	1.3	1.4	1.3	1.4	1.6
Nov. †	1.4	1.3	1.5	1.6	1.8	1.9	1.8	1.9	2.1	2.3
Dec. *	2.4	2.3	2.2	2.2	2.2	2.2	2.1	2.2	2.4	2.2
Means	1.98	1.68	1.60	1.58	1.56	1.58	1.57	1.54	1.56	1.68

ST. LOUIS, MO.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	12.6	12.4	12.3	12.1	12.1	12.1	12.0	12.3	12.5	12.8
Feb	10.8	10.7	10.8	10.6	10.7	10.7	10.9	11.0	11.5	11.8
Mar	11.5	11.3	11.3	11.3	11.4	11.2	11.5	11.6	12.2	12.7
Apr	11.5	11.4	11.4	11.6	11.5	11.5	11.1	11.5	12.2	12.8
May	9.8	9.4	9.2	8.9	8.8	8.6	8.8	8.9	9.8	10.8
June	7.8	7.6	7.4	7.2	7.2	6.9	7.2	7.6	8.3	8.8
July	7.1	6.9	6.7	6.5	6.3	6.4	6.3	6.7	7.3	7.8
Aug	7.6	7.2	7.1	6.9	6.9	6.7	6.5	6.7	7.3	7.7
Sept	9.4	8.9	8.8	8.6	8.5	8.2	8.2	8.2	8.6	9.0
Oct	10.4	9.9	9.6	9.4	9.3	9.2	9.3	9.3	9.5	9.9
Nov	11.2	11.0	10.8	10.7	10.9	11.1	11.2	11.0	11.1	11.5
Dec	11.4	11.1	11.2	11.2	11.3	10.9	11.2	11.3	11.4	11.8
Means	10.09	9.82	9.72	9.58	9.58	9.46	9.52	9.68	10.14	10.62

ST. PAUL, MINN.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	5.1	5.2	5.1	5.1	5.0	5.1	5.1	5.1	5.5	5.7
Feb	5.4	5.6	5.5	5.2	5.3	5.3	5.2	5.5	5.6	5.9
Mar	5.6	5.6	5.5	5.3	5.5	5.4	5.2	5.6	6.4	7.3
Apr	6.9	6.6	6.8	6.7	6.5	6.5	6.9	7.4	8.5	9.6
May	4.8	5.0	5.1	5.2	5.2	5.0	5.4	6.1	7.0	8.0
June	4.1	4.0	3.8	3.6	3.4	3.5	3.7	4.5	5.6	6.5
July	3.7	3.9	3.9	3.9	3.7	4.0	3.9	4.2	5.4	6.0
Aug	4.2	3.8	4.0	4.1	4.0	3.9	4.1	4.5	5.2	6.3
Sept	5.6	5.7	5.7	5.8	5.6	5.2	5.1	5.3	6.3	7.4
Oct	5.2	5.2	5.2	5.1	5.4	5.3	5.2	5.2	5.9	6.9
Nov	5.3	5.5	5.4	5.6	5.5	5.6	5.7	5.6	5.7	6.2
Dec	5.5	5.4	5.5	5.5	5.3	5.5	5.4	5.5	5.7	5.9
Means	5.12	5.12	5.12	5.09	5.03	5.02	5.08	5.38	6.07	6.81

* Six years. † Five years.

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

ROSEBURGH, OREGON.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
2.4	2.6	2.6	2.9	3.3	3.7	4.2	4.1	4.5	3.5	3.0	2.8	2.6	2.4	2.8
1.8	1.9	2.3	2.6	2.9	3.4	3.6	4.0	4.1	4.0	3.3	2.4	2.0	2.0	2.4
1.7	1.9	2.5	3.1	3.6	4.2	4.6	5.0	5.3	5.4	5.1	3.6	2.8	2.0	2.9
2.0	2.8	3.7	4.3	4.7	5.5	5.9	6.4	6.9	6.9	6.8	5.6	4.1	2.9	3.6
1.7	2.2	3.2	3.5	4.2	4.6	5.3	6.0	6.8	7.1	7.2	6.2	4.3	2.9	3.4
2.2	2.7	3.4	3.9	4.4	5.1	5.8	6.6	7.2	7.6	7.6	6.9	5.4	3.7	3.6
2.5	2.9	3.5	3.9	4.6	4.5	6.2	6.9	7.5	8.1	8.3	7.9	6.3	4.1	3.8
1.4	2.0	2.4	3.4	4.0	4.8	5.8	6.4	7.1	7.6	7.5	6.7	4.5	3.0	3.3
1.2	1.8	2.6	3.2	3.8	4.8	5.2	6.0	6.6	6.8	6.2	4.3	3.0	2.1	2.9
1.7	1.8	2.4	2.3	2.6	3.5	4.1	4.5	4.7	4.5	3.4	2.4	1.8	1.4	2.3
2.2	2.2	2.2	2.6	2.8	3.2	3.5	3.7	3.4	2.8	1.9	1.6	1.6	1.5	2.2
2.3	2.2	2.5	2.5	2.9	3.3	3.5	3.5	3.2	2.9	2.7	2.6	2.4	2.5	2.4
1.92	2.25	2.78	3.18	3.65	4.22	4.81	5.26	5.61	5.60	5.25	4.42	3.40	2.54	2.97

ST. LOUIS, MO.

12.8	12.6	12.6	12.8	12.7	12.6	12.4	11.9	11.4	11.6	11.7	11.9	12.3	12.4	12.3
11.8	11.9	12.4	12.7	12.9	12.8	12.4	11.7	11.3	10.7	11.1	10.9	11.1	10.5	11.4
12.6	12.8	13.2	13.4	13.6	13.4	13.5	12.9	12.5	11.7	11.6	11.5	11.7	11.8	12.2
13.2	13.7	14.2	14.3	14.8	14.9	14.5	14.3	13.6	12.0	11.5	11.5	11.4	11.4	12.6
11.4	11.9	12.1	12.3	12.7	12.9	12.7	12.4	11.8	10.5	9.6	9.2	9.4	9.5	10.5
9.5	9.7	10.4	10.7	11.1	11.2	10.9	10.9	10.3	8.6	7.8	8.0	7.7	7.8	8.9
8.2	8.6	9.1	9.1	9.3	8.9	9.5	9.5	9.0	8.1	7.2	7.0	7.2	7.1	7.8
8.4	9.0	9.1	9.4	9.5	9.4	9.5	9.6	9.0	8.0	7.5	7.4	7.2	7.3	7.9
9.7	10.6	10.7	10.9	11.3	11.3	11.4	11.0	10.1	9.3	9.5	9.4	9.4	9.5	9.6
10.5	10.9	11.3	11.6	11.7	11.8	11.8	10.8	10.3	10.0	10.1	10.2	10.3	10.3	10.3
11.4	11.5	12.3	12.7	12.9	12.9	12.8	11.8	11.3	11.4	11.3	11.1	11.4	11.2	11.5
12.0	12.0	12.4	12.3	12.4	12.4	12.4	12.1	11.9	12.0	11.8	11.8	11.8	11.5	11.8
10.96	11.27	11.65	11.85	12.08	12.04	11.98	11.58	11.04	10.32	10.06	9.99	10.08	10.02	10.56

ST. PAUL, MINN.

5.9	6.5	7.2	7.2	7.3	7.3	6.7	6.0	5.6	5.7	5.6	5.2	5.1	5.3	5.8
6.6	7.1	7.8	8.4	8.7	8.8	8.3	8.1	7.1	6.5	6.4	6.2	6.0	5.3	6.5
8.1	8.5	8.8	9.1	9.6	9.5	9.1	8.3	7.2	5.9	5.7	5.8	6.1	6.1	6.9
10.4	10.9	11.4	11.8	12.1	12.2	12.0	11.3	10.0	8.6	7.6	7.4	7.5	7.2	8.9
9.1	9.8	10.5	10.6	10.7	10.6	10.4	9.9	9.2	7.5	6.0	5.7	5.3	5.1	7.4
7.3	8.2	8.7	8.9	9.1	9.1	9.2	9.0	8.1	6.6	5.0	4.1	3.9	3.9	6.0
6.8	7.3	7.7	8.2	8.3	8.4	7.7	7.4	6.7	5.4	4.3	3.9	3.8	3.7	5.5
7.2	7.9	8.3	8.6	8.6	8.7	8.5	8.0	7.1	5.8	4.9	4.6	4.8	4.5	5.9
8.4	9.5	10.0	10.2	10.5	10.2	10.1	9.1	7.4	6.5	6.1	6.2	6.0	5.8	7.2
7.8	8.1	8.6	9.0	9.4	9.2	8.9	7.5	6.0	5.4	5.2	5.1	5.2	5.7	6.5
5.6	7.6	8.0	8.3	8.5	8.3	7.5	6.5	6.0	5.9	5.9	5.7	5.4	5.5	6.3
6.4	6.8	7.4	7.4	7.5	7.5	6.9	6.1	5.8	5.7	5.6	5.6	5.6	5.6	6.0
7.47	8.18	8.71	8.98	9.19	9.15	8.78	8.10	7.18	6.29	5.69	5.46	5.39	5.31	6.58

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

ST. VINCENT, MINN.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	8.5	8.6	8.4	8.2	8.5	8.4	8.3	8.1	8.1	8.1
Feb	8.6	8.1	7.7	7.9	8.0	8.1	8.4	8.2	8.1	8.6
Mar	8.0	7.9	8.2	8.3	8.1	8.1	7.7	7.7	8.4	9.4
Apr	8.0	7.9	8.2	8.1	8.1	8.2	8.3	8.6	9.9	11.0
May	7.1	7.0	7.0	7.3	7.2	7.1	7.4	8.1	9.6	10.8
June	6.4	6.3	6.3	6.3	6.5	6.3	6.3	7.3	8.5	9.2
July	5.3	5.3	5.3	5.3	5.2	5.1	5.2	5.6	6.7	7.6
Aug	5.2	5.2	5.1	5.0	4.9	5.1	4.9	5.4	6.5	7.7
Sept	6.6	6.9	7.2	7.1	7.0	7.1	7.1	7.4	8.1	9.5
Oct	7.4	7.2	7.1	7.1	7.1	7.3	7.1	7.2	7.7	8.8
Nov	7.7	7.7	7.6	7.9	8.0	7.7	7.6	7.7	7.7	8.3
Dec	7.8	7.9	8.1	8.3	8.3	8.3	8.0	7.9	7.8	8.0
Means	7.22	7.17	7.18	7.23	7.24	7.23	7.19	7.43	8.09	8.92

SALT LAKE CITY, UTAH.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1884 to 1889.										
Jan	3.5	3.8	3.8	4.0	3.9	4.1	3.9	3.9	3.8	3.6
Feb	3.8	4.1	4.1	3.8	3.6	3.8	3.8	3.8	3.8	3.6
Mar	4.0	3.8	3.9	3.7	3.8	3.7	3.5	3.4	3.5	3.5
Apr	4.6	4.4	4.2	3.9	3.9	3.9	3.8	3.8	3.8	3.8
May	5.2	4.7	4.4	4.3	4.0	3.8	3.7	3.6	3.3	3.8
June	5.0	4.8	4.2	4.0	3.7	3.8	3.8	3.7	2.9	3.2
July	5.1	4.5	4.2	3.6	3.7	3.5	3.2	3.2	2.6	2.7
Aug	4.8	4.3	4.1	3.7	3.7	3.6	3.5	3.3	3.0	2.8
Sept	4.2	3.8	3.7	3.6	3.4	3.3	3.2	3.1	3.1	2.7
Oct	3.6	3.4	3.4	3.4	3.5	3.4	3.3	3.2	3.1	3.0
Nov	3.4	3.2	3.2	3.2	3.2	3.2	3.0	3.1	3.0	3.0
Dec	4.3	4.3	4.0	4.1	3.9	4.0	4.1	4.2	4.4	3.9
Means	4.29	4.09	3.93	3.78	3.69	3.68	3.57	3.52	3.36	3.30

SAN DIEGO, CAL.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	3.8	3.9	4.1	4.0	4.3	4.3	4.1	4.1	4.1	4.1
Feb	4.4	4.5	4.5	4.6	4.7	4.6	4.6	4.8	4.7	4.8
Mar	3.7	3.6	3.9	3.8	4.1	4.0	4.0	3.9	4.0	4.0
Apr	4.1	4.1	4.2	3.9	3.9	3.9	3.8	4.1	4.0	4.0
May	3.7	3.7	3.5	3.3	3.4	3.4	3.6	3.5	3.4	3.6
June	3.6	3.4	3.4	3.6	3.7	3.5	3.6	3.5	3.4	3.6
July	2.9	2.8	2.6	2.7	2.8	2.8	2.8	2.9	2.9	3.1
Aug	2.8	2.5	2.3	2.4	2.6	2.6	2.4	2.6	2.4	2.7
Sept	2.7	2.6	2.7	2.8	2.8	2.8	3.0	2.9	3.0	2.9
Oct	2.9	2.9	3.0	3.0	3.1	3.0	3.0	3.5	3.5	3.2
Nov	3.1	3.3	3.3	3.2	3.5	3.6	3.4	3.6	3.6	3.4
Dec	3.8	4.0	3.8	3.9	3.9	4.1	4.0	3.8	4.1	4.2
Means	3.46	3.44	3.44	3.43	3.57	3.55	3.52	3.60	3.59	3.63

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

ST. VINCENT, MINN.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
8.8	9.5	10.1	10.8	11.3	11.6	11.0	10.1	9.2	8.7	8.6	8.4	8.5	8.5	9.2
9.6	10.4	11.3	11.5	11.8	11.9	11.6	10.8	9.6	9.1	8.9	8.9	9.0	8.7	9.4
10.2	11.2	11.5	12.0	12.5	12.4	12.1	11.6	10.5	8.9	8.5	8.3	8.1	8.1	9.5
11.1	12.8	12.8	12.9	13.0	13.0	13.0	12.3	11.6	10.3	8.9	8.5	8.4	8.4	10.2
11.7	12.2	12.8	12.8	13.1	13.2	13.1	12.9	12.2	10.8	8.9	7.7	7.3	7.1	9.8
10.3	10.9	11.0	11.2	11.3	11.6	11.6	11.2	10.4	9.1	7.3	6.6	6.7	6.4	8.6
8.2	8.7	8.9	9.0	9.2	9.4	9.6	9.2	8.6	7.0	5.5	5.0	5.1	5.1	6.9
8.6	9.5	9.8	10.0	10.4	10.3	9.9	9.1	8.1	6.3	5.3	5.3	5.3	5.2	7.0
11.0	11.8	12.3	12.5	12.8	12.6	12.1	11.4	9.7	7.8	7.2	7.2	7.1	7.3	9.0
10.2	11.1	11.6	11.6	11.7	11.7	11.4	9.9	8.1	7.5	7.4	7.4	7.3	7.4	8.7
9.3	10.3	11,2	11.4	11.4	11.1	10.4	8.9	8.2	8.3	8.3	8.3	8.1	8.0	8.8
8.2	9.7	10.6	10.8	11.0	10.7	10.1	9.2	8.7	8.5	8.5	8.2	7.9	8.4	8.8
9.77	10.68	11.16	11.38	11.62	11.62	11.33	10.55	9.58	8.52	7.78	7.48	7.40	7.38	8.81

SALT LAKE CITY, UTAH.

3.6	3.6	4.2	5.1	5.7	6.0	6.2	6.2	5.5	4.3	3.8	3.6	3.5	3.8	4.3
3.9	4.4	5.1	5.9	6.8	7.4	7.9	7.7	7.2	6.0	4.7	4.4	4.3	4.1	4.9
3.9	5.3	6.3	7.6	8.4	9.1	9.4	9.0	8.2	7.0	5.4	4.6	4.2	4.1	5.4
4.7	6.2	7.4	8.6	9.3	9.3	9.6	9.2	8.6	7.6	6.2	5.3	5.1	5.2	5.9
4.9	6.1	7.5	8.3	9.0	9.3	9.7	9.5	9.0	7.9	6.4	5.4	5.4	5.4	6.0
4.6	6.5	7.8	8.8	9.8	10.1	10.2	9.5	8.8	7.8	6.5	5.8	6.3	5.7	6.1
3.4	5.1	6.3	7.4	8.2	9.0	9.2	9.0	8.9	7.8	6.2	6.5	7.0	6.0	5.7
3.2	4.6	5.9	7.0	7.7	8.2	8.4	8.1	7.9	6.8	5.8	6.2	6.0	5.4	5.3
3.0	4.0	5.4	6.8	8.0	8.6	9.1	8.8	7.8	5.9	4.6	4.7	4.8	4.4	5.0
3.0	4.0	5.3	6.6	7.7	8.7	8.8	8.4	7.2	5.2	4.2	3.9	3.7	4.1	4.8
3.0	3.3	3.9	5.0	5.9	6.4	6.8	6.7	5.4	4.0	3.4	3.3	3.4	3.3	4.0
3.8	4.2	4.6	5.3	6.0	6.8	6.7	6.5	5.7	4.3	4.0	4.3	4.3	4.3	4.7
3.75	4.78	5.81	6.87	7.71	8.24	8.50	8.22	7.52	6.22	5.06	4.83	4.83	4.65	5.18

SAN DIEGO, CAL.

3.9	3.3	4.1	5.1	6.7	8.0	8.6	8.5	8.1	6.7	5.0	4.2	3.9	4.0	5.0
4.3	4.3	5.2	6.6	8.2	9.4	10.2	10.0	9.5	8.3	6.2	4.9	4.5	4.4	5.9
3.8	4.5	5.7	7.2	8.7	10.0	10.4	10.1	9.6	8.8	7.2	5.3	4.1	3.9	5.8
4.5	5.5	7.4	9.0	10.6	10.9	11.2	10.9	10.3	9.6	8.4	6.2	4.9	4.2	6.4
4.4	5.8	8.1	9.5	10.5	11.1	11.2	11.0	10.1	9.5	8.0	6.3	5.0	4.1	6.2
4.3	6.2	7.9	9.9	10.8	11.3	11.6	10.9	10.3	8.8	8.0	6.4	5.2	4.1	6.3
4.2	5.9	8.0	9.8	10.7	11.4	11.0	10.5	10.0	9.1	8.1	6.6	4.9	3.7	5.8
3.6	5.3	7.4	9.3	10.2	10.7	10.7	10.2	9.7	8.9	7.5	5.9	4.4	3.2	5.5
3.4	4.9	6.9	9.1	10.5	11.0	11.1	10.4	9.8	8.6	6.6	5.0	3.9	3.0	5.5
3.3	4.1	5.8	7.7	9.5	10.3	10.4	10.3	9.1	7.3	5.1	3.7	3.2	3.0	5.1
3.1	3.3	4.3	5.9	7.7	8.8	9.4	9.1	8.0	6.0	3.9	3.5	3.2	3.1	4.7
4.1	3.5	4.3	5.2	6.7	8.1	8.6	8.5	7.4	5.9	4.3	3.9	3.8	3.9	4.9
3.91	4.72	6.26	7.86	9.23	10.08	10.37	10.03	9.32	8.12	6.52	5.16	4.25	3.72	5.61

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

SAN FRANCISCO, CAL.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	5.2	4.9	5.1	5.4	5.5	5.6	5.7	5.7	5.9	5.6
Feb	6.1	5.6	5.4	5.5	5.3	5.4	5.5	5.7	5.6	5.4
Mar	7.4	6.7	6.1	5.8	5.5	5.6	5.5	5.7	5.7	5.9
Apr	9.0	8.0	7.5	7.1	6.7	6.2	6.0	5.8	5.8	5.8
May	9.1	8.1	7.3	7.1	6.9	6.7	6.3	6.1	6.0	6.2
June	11.2	10.1	9.4	8.7	8.5	8.0	7.5	6.8	6.5	6.9
July	11.1	9.9	9.2	8.5	8.1	7.5	7.2	6.8	6.8	6.8
Aug	10.3	9.4	8.6	8.0	7.7	7.3	7.0	6.5	6.5	6.4
Sept	7.9	7.1	6.3	6.0	5.6	5.2	5.2	4.8	4.3	4.4
Oct	6.0	5.6	5.2	4.8	4.6	4.6	4.5	4.6	4.0	4.4
Nov	5.1	4.7	4.7	4.9	4.7	4.7	4.6	4.7	4.8	4.9
Dec	6.6	6.1	6.0	6.2	6.1	6.3	6.2	6.4	6.4	6.3
Means	7.92	7.19	6.73	6.50	6.27	6.10	5.93	5.80	5.69	5.75

SANTA FÉ, N. MEX.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1886 to 1889.										
Jan*	6.3	6.0	5.8	6.1	6.5	6.4	6.6	6.7	6.7	6.6
Feb*	6.2	6.0	6.2	5.9	5.7	5.9	6.2	6.4	6.2	6.5
Mar*	5.6	5.8	5.6	5.3	5.0	4.7	4.9	5.2	5.0	5.1
Apr*	6.9	6.4	6.2	5.8	5.8	5.9	5.6	5.4	5.8	7.0
May*	6.9	6.8	6.8	5.6	5.0	4.8	4.4	4.1	4.5	5.6
June*	5.7	5.4	5.4	5.0	4.6	4.3	3.9	3.6	3.5	4.3
July	6.0	5.5	4.6	4.3	3.9	3.7	3.5	3.5	3.5	3.8
Aug	5.1	4.4	4.1	4.6	3.5	3.3	3.3	3.1	2.8	3.5
Sept	5.0	4.3	4.0	3.5	3.2	3.0	2.9	2.6	2.4	3.0
Oct	5.1	4.9	4.7	4.5	4.1	4.4	4.0	4.4	4.1	4.6
Nov	4.9	4.9	4.9	5.3	5.1	5.2	5.4	5.2	5.3	5.8
Dec	4.6	4.4	4.5	4.5	4.8	5.3	5.3	5.1	5.1	5.1
Means	5.69	5.40	5.23	5.03	4.77	4.74	4.67	4.61	4.58	5.08

SAVANNAH, GA.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1884 to 1889.										
Jan	7.1	7.1	7.1	7.1	7.2	7.4	7.2	7.2	7.6	8.1
Feb	6.6	6.8	6.9	6.7	6.9	7.1	7.0	6.9	7.6	8.2
Mar	7.3	7.3	7.3	7.2	7.1	6.7	6.8	6.9	8.0	8.5
Apr	6.6	6.3	6.1	6.1	6.2	6.3	6.5	7.1	8.0	8.5
May	6.1	5.8	5.6	5.4	5.3	5.4	5.8	6.7	7.4	7.6
June	4.8	4.7	4.8	4.6	4.5	4.7	5.1	6.2	7.1	7.2
July	4.7	4.5	4.6	4.7	4.8	4.9	5.0	5.8	6.2	6.6
Aug	4.4	4.2	4.3	4.3	4.4	4.5	4.5	5.3	6.1	6.5
Sept	4.8	4.8	4.8	4.8	4.9	5.1	4.9	5.3	6.8	7.8
Oct	5.4	5.1	5.5	5.2	5.5	5.6	5.6	5.9	6.9	7.9
Nov	5.6	5.5	5.7	5.7	6.1	6.1	6.1	5.8	6.4	7.2
Dec	5.9	5.9	5.9	5.9	5.9	6.0	6.1	6.2	6.2	6.8
Means	5.80	5.67	5.72	5.64	5.73	5.82	5.88	6.28	7.02	7.58

* Five years' record.

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

SAN FRANCISCO, CAL.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
5.6	6.0	6.6	6.8	7.2	7.3	7.7	7.9	7.6	7.3	6.8	6.4	5.7	5.2	6.2
5.8	6.5	7.6	7.3	7.5	8.1	8.9	9.4	9.8	10.0	9.1	8.2	7.2	6.5	7.0
6.3	7.1	7.7	8.0	8.8	9.8	11.3	12.5	13.1	13.6	12.9	11.0	9.3	8.1	8.3
6.8	7.5	8.3	9.2	10.9	13.1	14.8	15.7	16.2	15.8	14.6	13.0	11.8	10.3	9.8
6.9	7.7	8.7	10.2	12.2	14.2	15.9	17.0	17.4	16.8	15 9	14.0	12.3	10.6	10.4
7.8	8.6	10.0	12.1	14.4	16.8	18.7	19.8	20.2	19.8	18.9	16.9	14.7	12.5	12.3
7.3	8.1	9.3	11.0	13.6	16.0	18.2	19.7	20.1	20.0	18.9	17.1	14.9	12.9	12.1
5.8	7.5	8.3	9.7	12.3	14.7	17.4	19.1	20.2	20 2	18.7	14.3	13.5	11.9	11.4
4.8	5.5	6.1	7.1	9.4	12.0	14.8	16.7	17.9	17.9	16.1	13.8	10.9	8.9	9.1
4.8	5.6	6.4	6.6	8.2	9.5	11.3	12.8	13.5	13.5	12.5	10.0	8.0	6.7	7.4
5.6	6.3	6.8	6.8	6.8	7.7	8.6	9.0	8.9	9.0	8.4	7.2	6.2	5.6	6.3
6.7	7.0	7.6	7.9	8.0	8.3	8.7	8.4	8.0	7.4	7.4	7.0	6.8	6.8	7.0
6.18	6.95	7.78	8.56	9.94	11.46	13.02	14.00	14.41	14.28	13.35	11.58	10.11	8.83	8.94

SANTA FÉ, N. MEX.

7.2	8.5	9.4	9.6	9.7	9.7	9.0	8.3	7.0	5.3	5.3	5.9	6.0	6.1	7.1
7.1	8.4	9.3	9.8	9.7	9.6	9.3	8.9	8.1	6.6	5.6	6.0	6.0	6.3	7.2
6.9	8.5	9.1	9.7	9.5	9.1	9.7	9.7	9.4	8.3	6.5	6.1	5.8	5.9	6.9
8.5	9.0	9.9	10.3	10.8	10.8	10.8	11.3	10.7	10.1	8.3	7.0	7.2	7.3	8.0
7.2	8.3	9.0	9.6	10.2	10.8	10.9	11.1	10.9	10.5	9.1	6.8	6.5	6.8	7.6
5.1	6.2	6.8	7.8	8.8	9.6	10.0	9.9	10.0	9.4	8.2	6.3	6.1	6.1	6.5
5.1	5.9	6.2	6.9	7.5	7.9	7.9	8.0	7.6	8.1	7.8	7.6	7.1	6.8	6.0
4.4	5.2	5.9	6.7	6.7	7.7	8.0	8.0	7.9	7.4	6.3	6.3	5.5	5.4	5.4
4.5	5.0	5.7	6.4	7.2	7.8	7.5	8.1	7.7	7.0	5.5	5.6	5.5	5.3	5.1
5.8	7.1	7.7	8.0	8.5	8.9	8.7	8.4	7.6	5.3	4.5	5.2	5.1	5.7	5.9
6.8	8.2	8.7	8.7	9.4	8.8	8.3	8.0	6.1	4.6	4.4	4.7	4.7	5.2	6.2
5.8	7.1	7.9	8.4	9.1	8.8	8.5	7.6	5.6	4.3	4.4	4.4	4.4	4.5	5.8
6.20	7.28	7.97	8.49	8.92	9.12	9.05	8.94	8.22	7.24	6.32	5.99	5.82	5.95	6.47

SAVANNAH, GA.

8.6	9.0	9.5	9.8	9.7	9.5	9.1	7.9	7.7	7.5	7.5	7.5	7.6	7.2	8.0
8.6	9.1	9.2	9.2	9.5	9.5	9.1	8.0	6.6	6.5	6.7	6.6	6.7	7.2	7.6
9.1	9.7	10.2	10.6	10.9	10.7	10.4	9.5	8.0	7.2	7.2	7.0	7.3	7.4	8.3
9.5	10.1	10.9	11.6	11.8	11.9	11.9	10.7	9.1	7.8	7.7	7.2	7.4	6.9	8.4
8.0	8.7	9.3	9.8	10.5	10.3	10.5	9.9	8.9	7.2	6.9	6.7	6.3	6.0	7.5
7.6	8.4	8.6	8.8	9.7	9.8	9.9	9.1	8.4	6.9	6.1	5.6	5.4	5.0	6.8
6.8	7.2	7.9	8.4	8.9	9.0	9.3	8.6	7.7	6.5	6.1	5.4	5.2	4.8	6.4
6.8	7.3	7.6	7.9	8.7	8.7	8.9	8.1	6.8	5.6	5.2	4.9	4.9	4.6	6.0
8.5	9.0	9.2	9.5	9.8	9.4	9.4	8.4	6.6	5.9	5.5	5.2	5.1	5.0	6.6
8.7	9.0	9.0	9.2	9.3	9.2	8.6	6.9	5.8	5.4	5.3	5.2	5.3	4.9	6.7
8.0	8.3	8.4	8.6	8.5	8.2	7.4	6.0	5.6	5.3	5.2	5.2	5.5	5.5	6.5
7.3	7.5	7.9	8.3	8.0	8.1	7.6	6.4	6.3	6.1	5.8	5.9	5.9	5.8	6.6
8.12	8.61	8.98	9.31	9.61	9.52	9.34	8.29	7.29	6.49	6.27	6.03	6.05	5.86	7.12

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

SPOKANE FALLS, WASH.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	3.8	3.6	3.5	3.6	3.6	3.8	3.7	3.4	3.3	3.3
Feb	3.1	3.1	3.0	3.1	3.0	3.0	2.9	2.7	2.8	3.0
Mar	3.4	3.3	3.2	3.2	2.9	3.2	3.5	3.4	3.5	3.5
Apr	3.8	3.8	3.9	3.6	3.9	4.0	4.1	3.8	3.8	4.3
May	3.5	3.3	3.0	3.2	3.4	3.2	3.3	3.4	3.7	4.4
June	3.5	3.3	3.2	3.1	3.1	3.4	3.3	3.3	3.6	4.4
July*	2.7	2.4	2.5	2.4	2.5	2.7	2.6	2.5	2.7	3.8
Aug	2.5	2.1	2.1	2.1	2.4	2.5	2.5	2.3	2.3	2.6
Sept	2.9	2.7	2.7	2.6	2.7	2.9	2.9	2.6	2.5	2.5
Oct	2.8	2.5	2.5	2.8	2.7	2.8	2.6	2.6	2.6	2.7
Nov	3.1	3.1	3.2	3.1	3.2	3.2	3.2	3.0	3.0	2.7
Dec	3.4	3.5	3.3	3.4	3.2	3.0	3.1	3.1	3.1	3.2
Means	3.21	3.06	3.01	3.02	3.05	3.14	3.14	3.01	3.08	3.37

TOLEDO, OHIO.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	8.4	8.7	8.5	8.5	8.7	8.8	8.6	8.7	8.9	9.3
Feb	8.6	8.7	8.6	8.4	8.3	8.6	8.2	8.5	9.0	9.6
Mar	8.5	8.3	8.3	8.3	8.3	8.4	8.4	8.5	9.4	10.1
Apr	8.5	8.3	8.3	8.5	8.8	8.6	8.5	9.4	10.6	11.2
May	6.4	6.5	6.4	6.3	6.1	6.3	6.5	6.9	7.6	8.1
June	5.7	5.7	5.6	5.8	5.9	5.8	5.7	6.8	7.0	7.6
July	5.8	5.8	5.7	5.8	5.8	5.7	5.8	6.2	7.0	7.5
Aug	5.4	5.4	5.6	5.6	5.9	5.6	5.7	6.1	6.6	7.4
Sept	6.2	6.3	6.4	6.3	6.4	6.4	6.4	6.5	7.3	7.9
Oct	7.3	7.2	7.2	7.3	7.2	7.2	7.4	7.4	8.2	9.1
Nov	8.9	9.0	9.1	9.2	8.9	9.0	9.1	9.1	9.2	10.3
Dec	8.5	8.4	8.5	8.6	8.7	8.7	8.5	8.7	8.9	9.3
Means	7.35	7.36	7.35	7.38	7.42	7.42	7.40	7.65	8.31	8.95

VICKSBURG, MISS.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	6.8	6.5	6.9	6.8	6.6	6.3	6.4	6.6	6.7	6.8
Feb	6.3	6.2	5.9	5.9	5.7	6.0	6.3	6.3	6.4	7.0
Mar	6.5	6.3	6.3	6.3	6.3	6.1	5.9	5.9	6.2	6.7
Apr	6.1	5.7	5.5	5.4	5.4	5.8	5.9	6.0	6.5	6.8
May*	5.4	5.4	5.5	5.1	5.2	4.9	5.0	5.4	5.9	6.3
June*	4.8	4.7	4.8	4.8	4.7	4.8	4.8	4.8	5.1	5.2
July	3.8	3.9	3.8	3.8	3.9	4.1	4.1	4.2	4.4	4.7
Aug	3.9	3.9	3.6	3.8	3.6	3.7	3.8	3.8	4.0	4.1
Sept	4.1	3.8	3.9	3.9	3.9	4.0	4.3	4.3	4.6	4.6
Oct	4.4	4.4	4.3	4.5	4.4	4.5	4.7	4.6	5.1	5.3
Nov	5.5	5.4	5.4	5.4	5.4	5.5	5.6	5.5	5.7	5.9
Dec	6.3	6.3	6.2	6.3	6.1	6.3	6.5	6.5	6.6	6.9
Means	5.32	5.21	5.18	5.17	5.10	5.17	5.28	5.32	5.60	5.86

* Six years.

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

SPOKANE FALLS, WASH.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
3.4	3.5	3.6	4.0	4.5	4.9	5.0	5.0	4.6	4.2	4.1	3.9	4.0	3.8	3.9
3.0	3.4	3.6	4.4	4.8	5.2	5.6	5.6	5.5	4.8	3.9	3.6	3.5	3.2	3.8
4.0	4.8	5.3	5.9	6.3	6.9	6.8	7.0	6.9	6.5	5.3	4.3	3.8	3.6	4.6
5.2	6.0	6.4	6.7	7.3	7.8	8.0	7.9	7.7	7.4	6.5	4.6	4.0	3.9	5.3
5.5	6.2	6.7	6.9	7.3	7.4	7.4	7.5	7.3	7.0	6.5	5.3	4.0	3.6	5.1
5.1	5.5	5.7	6.1	6.4	6.8	7.1	7.1	7.0	6.9	6.6	5.3	4.2	3.8	4.9
4.3	4.9	5.5	5.8	6.4	6.6	6.7	6.9	6.8	6.7	6.4	5.4	3.6	2.9	4.4
3.7	4.3	4.7	5.2	5.4	5.6	5.6	6.3	6.1	5.7	5.2	3.9	2.8	2.5	3.8
3.2	4.3	4.9	5.3	5.8	6.2	6.4	6.4	6.3	5.7	4.2	3.4	3.3	3.1	4.0
2.9	3.6	4.1	4.5	4.9	5.1	5.3	5.4	4.8	4.0	3.5	3.1	3.0	3.1	3.6
2.8	3.2	3.7	4.1	4.5	4.7	4.7	4.6	4.1	3.3	3.1	3.1	3.2	3.2	3.5
3.2	3.4	3.7	4.0	4.4	4.4	4.6	4.4	4.1	3.7	3.7	3.6	3.6	3.7	3.6
3.86	4.42	4.82	5.24	5.67	5.97	6.10	6.18	5.93	5.49	4.92	4.12	3.58	3.37	4.21

TOLEDO, OHIO.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
9.7	10.2	10.8	10.8	11.0	10.9	10.5	9.7	9.1	8.9	8.8	9.0	9.0	8.6	9.3
10.1	10.4	10.6	10.9	11.1	11.3	10.7	10.8	9.1	9.0	8.9	9.0	9.2	8.9	9.4
10.8	11.5	12.0	12.2	12.5	12.6	12.3	11.4	9.8	8.7	8.9	8.6	8.5	8.5	9.6
11.6	12.3	12.8	13.4	13.6	13.5	13.2	12.1	10.3	9.2	8.7	8.7	8.8	8.6	10.3
8.9	9.7	10.3	10.9	11.0	10.9	10.5	9.5	8.2	7.1	6.3	6.1	6.4	6.3	7.9
8.5	9.3	9.6	10.2	10.6	10.1	9.8	9.0	7.6	6.3	5.5	5.2	5.5	5.4	7.2
8.1	9.1	9.2	9.7	10.0	9.7	9.5	8.9	7.8	6.5	5.6	5.3	5.6	5.7	7.2
8.2	9.2	9.8	10.2	10.4	10.1	9.5	8.5	6.8	5.6	5.1	5.1	5.3	5.7	7.0
8.9	9.7	10.6	11.1	11.3	10.9	10.3	9.4	7.5	6.3	6.2	6.2	6.4	6.6	7.8
9.6	10.0	10.6	10.6	10.8	10.5	9.8	8.4	7.4	7.1	7.2	7.3	7.5	7.3	8.3
10.8	11.5	11.7	11.7	11.7	11.3	10.4	9.3	8.9	8.9	8.9	9.2	9.3	9.4	9.8
10.3	11.0	11.1	11.3	11.1	10.5	9.5	9.0	8.6	9.0	8.6	8.4	8.6	8.6	9.3
9.62	10.32	10.76	11.08	11.26	11.02	10.50	9.67	8.42	7.72	7.39	7.34	7.51	7.47	8.60

VICKSBURG, MISS.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
6.9	7.0	7.2	7.1	7.4	7.5	7.2	6.9	6.2	6.3	6.5	6.9	6.9	7.0	6.8
7.2	7.2	7.8	8.0	8.2	7.9	7.7	7.2	6.5	6.1	6.2	6.2	6.2	6.4	6.7
6.8	7.1	7.5	7.6	8.0	8.0	7.6	7.3	6.6	5.8	6.1	6.3	6.5	6.5	6.7
7.2	7.5	7.5	7.5	7.9	7.9	7.8	7.4	6.2	5.2	5.3	5.6	5.9	6.0	6.4
6.6	7.0	7.6	7.7	8.0	7.9	7.6	7.2	6.2	4.9	4.4	4.8	5.3	5,2	6.0
5.6	5.9	6.3	6.3	6.7	6.7	6.7	6.3	5.7	4.6	3.9	4.1	4.3	4.5	5.3
4.9	5.2	5.9	6.1	5.9	6.1	6.2	5.7	5.2	4.2	3.6	3.8	4.1	4.0	4.6
4.5	4.6	5.3	5.4	5.6	5.9	6.1	5.7	5.0	3.6	3.2	3.5	3.7	3.7	4.3
4.6	5.1	5.7	5.9	6.0	5.9	5.4	5.1	3.9	3.2	3.4	3.3	3.8	4.1	4.5
5.6	6.0	6.3	6.4	6.8	6.6	6.3	5.2	3.9	4.0	4.3	4.3	4.4	4.5	5.0
6.0	6.1	6.7	6.9	6.8	6.8	6.3	5.4	4.6	4.8	4.9	5.2	5.3	5.5	5.7
6.9	6.9	6.9	6.8	7.0	6.9	6.7	6.0	5.7	5.9	6.2	6.4	6.5	6.6	6.5
6.07	6.30	6.72	6.81	7.02	7.01	6.80	6.28	5.48	4.88	4.83	5.03	5.24	5.33	5.71

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

WASHINGTON CITY.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1875 to 1888.										
Jan	4.6	4.7	4.5	4.3	4.2	4.3	4.3	4.3	5.0	6.0
Feb	4.9	4.7	4.8	4.8	4.8	4.8	4.8	4.9	5.8	6.8
Mar	5.7	5.6	5.6	5.5	5.6	5.6	5.7	6.5	8.2	8.8
Apr	5.0	4.9	4.8	5.0	5.0	4.8	5.0	6.0	7.3	8.0
May	3.9	3.8	3.8	3.7	3.6	3.6	4.1	5.1	6.0	6.5
June	3.4	3.3	3.2	3.2	3.1	3.3	3.8	4.7	5.6	6.0
July	3.0	2.9	2.8	2.9	2.9	2.9	3.4	4.3	5.0	5.5
Aug	2.6	2.5	2.6	2.6	2.7	2.8	3.0	3.8	4.7	5.1
Sept	3.2	3.3	3.2	3.2	3.3	3.3	3.3	4.0	4.9	5.6
Oct	3.5	3.6	3.5	3.5	3.4	3.6	3.6	4.1	5.5	6.4
Nov	4.4	4.3	4.4	4.2	4.1	4.2	4.2	4.4	5.4	6.3
Dec	5.0	5.0	4.9	4.6	4.5	4.5	4.6	4.6	5.3	6.2
Means	4.10	4.05	4.01	3.96	3.93	3.98	4.15	4.72	5.72	6.43

WHIPPLE BARRACKS, ARIZ.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	3.9	4.0	3.8	3.6	3.7	3.5	3.6	3.8	3.9	3.9
Feb	5.2	5.2	5.0	5.0	4.9	4.9	4.6	4.4	4.1	4.0
Mar	4.9	4.3	4.1	3.9	3.7	3.8	3.8	3.4	3.4	3.4
Apr	5.5	5.4	5.1	5.1	4.8	4.2	4.0	3.8	3.6	4.5
May	4.8	4.6	4.3	4.0	3.7	3.4	3.3	3.0	2.8	4.2
June	4.2	3.9	3.4	3.4	3.0	2.6	2.4	2.4	2.3	3.6
July	4.6	4.3	3.7	3.6	3.4	2.8	2.5	2.2	1.9	2.6
Aug	3.9	3.8	3.3	3.4	3.2	3.0	2.8	2.6	2.2	2.2
Sept	3.6	3.2	3.1	2.7	2.8	2.7	2.6	2.5	2.5	2.3
Oct	3.8	3.4	3.3	3.3	3.1	3.0	2.9	2.8	2.7	2.5
Nov	3.4	3.3	3.3	3.3	3.4	3.2	3.1	3.1	3.3	3.3
Dec	4.9	4.8	4.8	4.5	4.5	4.5	4.4	4.4	4.4	4.5
Means	4.39	4.18	3.93	3.82	3.68	3.47	3.33	3.20	3.09	3.42

WILMINGTON, N. C.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	6.1	6.2	6.5	6.4	6.3	6.3	6.2	6.4	7.2	8.2
Feb	6.0	6.1	6.2	6.4	6.4	6.4	6.4	6.9	7.6	8.6
Mar	6.5	6.5	6.4	6.2	6.1	6.0	6.0	6.9	8.2	9.2
Apr	6.0	5.9	5.8	5.8	5.7	5.7	6.0	7.3	8.3	8.8
May	4.8	4.7	4.5	4.4	4.4	4.4	4.9	6.3	7.3	7.7
June	5.1	4.7	4.9	4.6	4.5	4.4	5.1	6.0	6.5	7.0
July	4.3	4.1	4.1	4.0	3.9	4.2	4.5	5.6	6.2	6.4
Aug	4.1	4.0	3.9	3.8	3.8	3.9	4.2	5.1	6.0	6.5
Sept	4.2	4.1	4.1	4.2	4.2	4.4	4.5	5.4	6.7	7.4
Oct	4.6	4.7	4.7	4.7	4.7	4.6	5.0	5.4	6.4	7.4
Nov	4.6	4.9	4.9	5.0	5.0	5.1	5.2	5.4	6.5	7.5
Dec	5.0	5.1	5.2	5.2	5.2	5.2	5.2	5.3	6.0	6.9
Means	5.11	5.08	5.10	5.06	5.02	5.05	5.27	6.00	6.91	7.63

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

WASHINGTON CITY.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
6.7	7.0	7.2	7.4	7.5	7.1	6.4	5.5	5.0	5.0	5.0	4.9	4.8	4.5	5.4
7.3	7.7	8.1	8.1	8.2	7.9	7.3	6.2	5.6	5.4	5.4	5.3	5.1	5.0	6.0
9.2	9.3	9.7	9.8	10.0	9.8	9.5	8.4	7.1	6.6	6.5	6.4	6.2	6.0	7.4
8.5	8.6	9.1	9.2	9.2	9.3	9.0	8.0	6.8	6.0	5.7	5.4	5.2	5.1	6.7
6.9	7.2	7.7	7.7	7.7	7.6	7.4	6.7	5.7	4.7	4.6	4.1	4.1	4.0	5.4
6.5	6.8	7.1	7.2	7.3	7.2	6.8	6.1	5.3	4.3	3.9	3.8	3.7	3.6	5.0
6.0	6.0	6.6	6.7	6.7	6.6	6.3	5.7	4.8	3.9	3.4	3.2	3.0	3.0	4.5
5.4	5.5	6.0	6.2	6.3	6.2	6.0	5.1	3.9	3.1	3.1	2.8	2.6	2.6	4.0
6.0	6.1	6.3	6.5	6.5	6.2	5.7	4.5	3.8	3.4	3.4	3.3	3.2	3.2	4.4
7.0	7.4	7.6	7.6	7.4	7.0	5.7	4.6	4.0	3.8	3.7	3.6	3.6	3.5	4.9
6.9	7.5	7.6	7.7	7.7	7.1	5.9	5.0	4.6	4.5	4.5	4.5	4.6	4.2	5.3
6.9	7.6	7.7	7.7	7.6	6.9	6.1	5.4	5.4	5.1	5.3	5.2	5.1	5.0	5.7
6.94	7.22	7.56	7.65	7.68	7.41	6.84	5.93	5.17	4.65	4.54	4.38	4.27	4.14	5.39

WHIPPLE BARRACKS, ARIZ.

4.0	4.5	6.6	8.5	9.6	9.5	9.9	9.3	8.3	6.6	5.3	4.7	4.3	4.1	5.5
4.3	5.9	8.4	10.2	11.1	11.5	12.2	12.4	11.9	10.4	8.1	6.8	6.4	5.8	7.2
4.2	6.7	9.4	10.5	11.4	12.2	12.6	12.7	12.7	11.6	9.1	7.0	6.1	5.6	7.1
7.7	10.7	12.4	13.5	14.3	14.7	15.4	15.7	15.3	14.4	12.4	8.7	7.3	6.1	9.0
7.8	10.9	12.3	13.5	14.5	15.0	15.5	15.8	15.4	14.7	12.9	8.6	6.1	5.2	8.6
7.9	10.4	13.1	14.5	15.3	16.1	16.7	17.0	16.5	15.7	14.0	9.6	6.4	4.7	8.8
4.8	7.3	9.1	10.1	11.0	12.0	12.9	12.7	12.6	12.0	10.6	7.9	5.8	5.0	6.9
3.7	6.4	8.0	9.1	9.9	10.9	11.3	11.7	11.4	11.3	9.0	6.5	5.2	4.3	6.2
4.1	7.8	9.5	10.3	10.9	11.6	11.6	11.5	11.2	10.3	7.7	5.4	4.3	4.0	6.2
3.8	6.8	9.7	10.9	11.6	11.9	11.7	11.8	11.2	9.1	6.7	5.3	4.7	4.0	6.3
3.3	4.6	7.0	8.9	9.5	9.9	10.1	9.9	8.9	6.6	4.9	4.3	3.9	3.7	5.3
4.4	5.2	7.1	8.7	9.6	9.9	10.1	9.5	8.1	6.6	5.8	5.0	4.7	4.7	6.0
5.00	7.27	9.38	10.72	11.56	12.10	12.50	12.50	11.96	10.78	8.88	6.65	5.43	4.77	6.92

WILMINGTON, N. C.

8.7	9.0	9.2	9.4	9.6	9.3	8.4	7.2	6.7	6.5	6.5	6.5	6.5	6.6	7.3
9.3	9.5	9.8	9.9	10.3	10.3	9.7	7.8	6.5	6.1	5.9	5.8	6.0	5.9	7.5
9.7	10.3	10.4	10.6	11.1	11.3	11.0	9.7	7.9	6.9	6.7	6.6	6.6	6.7	8.1
9.2	9.7	10.3	10.9	11.5	11.6	11.2	10.3	8.4	7.1	7.0	6.7	6.6	6.2	8.0
8.2	8.8	9.3	9.8	10.3	10.6	10.4	9.3	7.5	6.1	5.7	5.4	5.2	5.0	6.9
7.1	7.8	8.4	9.1	9.4	9.7	9.5	9.0	7.7	6.3	5.6	5.4	5.1	5.0	6.6
6.8	7.1	7.9	8.5	9.0	9.1	8.9	8.2	7.0	5.5	5.0	4.8	4.4	4.4	6.0
6.9	7.2	7.4	7.7	8.2	8.4	8.2	7.5	5.9	4.8	4.5	4.5	4.4	4.4	5.6
7.7	8.0	8.2	8.6	8.8	8.7	8.0	6.6	5.0	4.5	4.6	4.3	4.3	4.3	5.8
7.9	8.1	8.1	8.1	8.4	8.5	7.5	5.7	4.8	4.7	4.7	4.5	4.5	4.6	5.9
8.1	8.5	8.7	8.8	8.7	8.4	7.0	5.7	5.1	4.8	4.6	4.7	4.7	4.4	6.1
7.7	8.1	8.5	8.4	8.5	8.2	7.0	5.8	5.5	5.2	5.1	5.1	5.1	5.0	6.1
8.11	8.51	8.85	9.15	9.48	9.51	8.90	7.73	6.50	5.71	5.49	5.36	5.28	5.21	6.67

AVERAGE VELOCITY OF THE WIND FOR EACH HOUR OF THE

WINNEMUCCA, NEV.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan *	8.0	8.2	8.6	8.7	9.0	8.9	8.9	9.3	9.0	9.0
Feb	7.7	7.8	7.9	8.0	8.1	8.2	8.0	7.8	7.8	8.2
Mar	7.8	7.8	7.9	7.6	7.8	7.7	7.8	7.4	7.6	7.6
Apr	8.1	8.5	9.0	8.6	8.8	8.4	8.1	8.0	7.9	8.0
May	7.5	7.7	6.5	8.0	7.8	7.8	7.4	7.2	6.8	7.0
June	8.1	8.0	7.7	7.7	7.5	7.2	7.0	6.8	6.9	7.1
July †	7.6	7.7	7.9	8.1	7.8	7.5	7.2	7.1	6.9	6.6
Aug †	6.5	7.4	8.1	8.1	7.5	7.1	6.8	6.9	6.5	6.2
Sept †	7.3	7.6	7.7	7.7	7.5	7.4	7.4	7.2	7.1	7.0
Oct †	7.1	7.3	7.2	6.9	7.5	7.3	7.2	7.2	7.5	7.5
Nov †	7.7	7.8	8.0	7.9	8.0	7.9	7.9	8.2	8.5	8.4
Dec *	8.5	8.5	8.4	8.4	8.5	8.5	8.6	8.5	8.9	9.0
Means	7.66	7.86	7.91	7.98	7.98	7.82	7.69	7.63	7.62	7.63

YUMA, ARIZ.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.
1883 to 1889.										
Jan	4.1	4.3	4.4	4.6	4.8	5.2	5.4	5.3	5.4	5.3
Feb	5.3	4.8	4.8	4.6	4.8	5.0	5.2	5.0	5.2	5.2
Mar	5.1	4.5	4.3	4.1	3.7	3.8	3.9	3.9	4.1	4.3
Apr	7.3	6.4	5.8	5.3	4.8	4.7	4.3	4.3	4.0	4.2
May	7.0	6.2	5.4	4.8	4.4	3.9	3.4	3.2	3.2	3.9
June	5.8	5.3	4.8	4.3	4.0	3.4	3.2	3.1	2.8	3.9
July	5.8	5.1	4.7	4.6	4.5	4.6	4.4	3.7	3.8	5.5
Aug	5.4	4.7	4.4	4.1	3.9	3.7	3.6	3.4	3.2	4.1
Sept	4.1	4.2	3.4	3.3	3.1	2.9	2.9	2.9	2.9	3.2
Oct	3.5	3.3	3.2	3.2	3.1	3.3	3.3	3.4	3.4	3.7
Nov	3.6	3.5	3.6	3.5	3.7	3.9	4.2	4.4	4.9	5.1
Dec *	4.1	3.9	4.0	4.2	4.3	4.7	5.0	5.0	4.9	5.2
Means	5.09	4.68	4.40	4.22	4.09	4.09	4.07	3.97	3.98	4.47

* Six years. † Five years.

DAY, SEVENTY-FIFTH MERIDIAN TIME, ETC.—Continued.

WINNEMUCCA, NEV.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
8.6	8.7	9.1	9.3	10.2	10.2	10.2	10.0	9.6	8.7	8.4	8.3	8.5	8.4	9.0
7.8	8.3	9.1	9.4	9.7	9.8	10.4	10.5	10.5	9.6	8.1	7.4	7.4	7.6	8.5
8.0	9.0	9.9	10.4	10.6	11.4	11.7	11.7	11.6	10.9	9.4	7.8	7.1	7.3	8.8
9.1	10.0	10.5	10.6	11.2	11.8	12.8	13.3	13.4	12.8	11.4	9.4	8.7	8.3	9.8
8.3	9.0	9.3	9.5	10.0	10.8	11.2	11.8	11.6	11.3	10.8	9.2	8.2	7.9	8.9
7.9	8.3	8.0	9.1	9.8	10.4	11.0	11.4	11.3	11.4	11.1	10.3	8.3	8.4	8.9
7.0	7.3	7.6	7.7	8.5	9.1	9.7	10.4	10.3	10.4	9.7	9.0	7.2	7.1	8.1
6.4	7.0	7.3	7.6	8.3	8.9	9.4	10.0	10.0	9.6	9.2	7.7	6.6	6.3	7.7
7.6	7.9	7.9	8.1	8.6	9.1	9.6	9.9	9.7	8.6	7.1	6.2	6.8	6.5	7.8
7.3	8.1	8.5	8.7	9.1	9.3	9.2	9.3	8.9	7.8	6.3	6.2	6.6	6.8	7.7
8.5	8.9	8.5	8.9	9.5	9.9	10.1	10.2	8.8	7.8	7.4	7.4	7.7	7.7	8.4
9.2	9.0	9.9	10.0	10.7	10.7	11.1	10.7	10.0	9.2	8.8	8.7	8.9	8.6	9.2
7.98	8.46	8.80	9.11	9.68	10.12	10.53	10.77	10.48	9.84	8.98	8.13	7.67	7.58	8.58

YUMA, ARIZ.

11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Mid.	Hourly means.
5.7	7.1	9.0	10.1	10.2	10.0	9.8	9.2	8.4	6.4	4.9	4.3	4.2	4.0	6.3
5.7	7.5	9.4	9.9	9.9	9.8	9.9	9.8	9.7	8.7	6.5	6.0	5.7	5.7	6.8
5.2	7.0	8.5	8.3	8.4	8.1	8.4	8.6	8.9	8.7	7.6	6.9	6.7	6.2	6.2
5.8	7.6	8.3	8.1	8.5	8.7	9.0	9.4	9.5	9.5	9.2	8.8	8.7	8.3	7.1
5.8	6.7	7.5	7.3	7.7	7.8	8.2	8.7	8.9	9.1	9.8	9.2	8.9	8.4	6.6
5.2	6.2	6.8	7.1	7.4	7.6	7.9	8.3	8.8	9.0	9.6	9.2	8.1	7.0	6.2
7.5	8.2	8.5	8.6	8.5	8.5	8.8	9.0	9.5	9.7	10.0	9.8	8.2	6.6	7.0
6.0	6.9	7.3	7.2	7.4	7.1	7.6	7.8	8.2	8.7	8.8	8.5	7.7	6.2	6.1
4.4	5.9	6.6	6.4	6.4	6.2	6.3	6.2	6.1	6.1	5.9	5.9	5.8	5.1	4.8
4.2	5.6	6.7	6.8	6.4	6.2	6.2	6.3	5.9	5.4	4.9	4.4	4.2	4.1	4.6
5.4	6.6	8.2	8.6	8.3	8.0	7.7	7.4	6.7	5.4	4.3	4.0	3.7	3.7	5.4
5.3	6.2	7.8	8.6	8.9	8.9	8.8	8.3	7.2	5.2	4.6	4.5	4.2	4.0	5.8
5.52	6.79	7.88	8.08	8.17	8.07	8.22	8.25	8.15	7.66	7.18	6.79	6.34	5.78	6.08

APPENDIX 15.

LIST OF VOLUNTARY OBSERVERS, POST SURGEONS, AND OTHERS WHO HAVE FURNISHED METEOROLOGICAL REPORTS FOR FOUR MONTHS OR MORE DURING 1889.

Stations.	Observers.	Stations.	Observers.
Alabama.		*Arizona*—Cont'd.	
Bermuda	William Fowler.	Duncan	B. Adams.
Butler	B. F. Gilder.	Eagle Pass (Curtis).	Dr. R. B. Tripp.
Citronelle	J. G. Michael.	Flagstaff	M. J. Riordan.
Columbiana	W. D. Lovett.	Florence	A. T. Colton.
Elkmont	D. J. Moore.	Fort Apache (1)	U. S. post surgeon.
Fayette	Daniel Collier.	Fort Bowie (1)	Do.
Florence	J. W. Milner.	Fort Huachuca	Do.
Gadsden	D. P. Goodhue.	Fort Lowell	Do.
Greensborough	M. H. Yerby.	Fort McDowell (2)	Do.
Livingston (2)	Prof. J. W. A. Wright.	Fort Mojave	Do.
Motes	A. M. Weiler.	Fort Verde (1)	Do.
Mount Vernon Barracks.	U. S. post surgeon.	Gila Bend	Daniel Murphy.
		Gillette	G. O. Wager.
Mount Willing	W. M. Garrett.	Globe	J. H. Hamill.
New Market	Dr. Geo. D. Norris.	Grand Central Mill.	E. W. Perkins.
Talladega	J. O. Huey.	Holbrook	David Rope.
Troy	James Waldaner.	Huachuca, Mount.	J. W. Stump.
Tuscaloosa	J. C. Perkins.	Lochiel	Mrs. A. F. Cameron.
Tuscumbia (2)	L. B. Thornton.	Maricopa	Pac. Rwy. system.
Union Springs	Rev. J. L. Moultrie.	Mesa City	C. R. Hakes.
Uniontown	W. H. Newman.	New River	J. F. Singleton.
Valley Head	Dr. E. P. Nicholson.	Oro	G. W. Wells.
Wiggins	Morgan D. Jones.	Pantano	Pac. Rwy. system.
		Payson	M. Thompson.
Alaska.		Peoria	S. H. Campbell.
Killisnoo	Joseph Zuboff.	Red Rock	W. A. Langham.
		St. John's	A. F. Banta.
Arizona.		San Carlos	U. S. post surgeon.
		San Simon	Pac. Rwy. system.
American Flag	J. H. Shields.	Show Low	G. M. Adams.
Antelope Valley	Mrs. J. H. Hamilton.	Signal	William Koshland.
Arizona Canal Co.'s Dam.	Cortez Cox.	Silver King	T. S. Collins.
		Stanton	E. Reissman.
Ash Cañon	John S. Robbins.	Strawberry	L. P. Nash.
Ash Creek	John H. Hudson.	Toviston	Miss Mary Tevis.
Ash Springs	J. D. Kinnear.	Texas Hill	Pac. Rwy. system.
Banghart's	George Banghart.	Tip Top	E. G. Wager.
Benson	Pac. Rwy. system.	Tombstone	S. C. Bagg.
Bisbee	Rev. J. G. Pritchard.	Tres Alamos	J. W. Calkins.
Buckeye	W. E. Hurley.	Tucson (1)	E. L. Wetmore.
Calabasas	E. R. Sykes.	Tucson (2)	Pac. Rwy. system.
Casa Grande	Pac. Rwy. system.	Volunteer Springs	W. J. Hill.
Cedar Springs	B. E. Norton.	Walnut Grove	T. B. Carter.
Chloride	H. P. Ewing.	Whipple B'ks (1)	U. S. post surgeon.
Cooley's Springs	C. E. Cooley.	Wilcox	Pac. Rwy. system.
Cottonwood	T. Carroll.	Williams	J. T. Ryan.
Crittenden	E. Vanderlip.	Willow Springs	F. A. Chamberlin.
Chiracahua Mountains.	D. D. Ross.	Winslow	J. A. Scott.
		Wood Cañon	T. D. Bridges.
Dos Cabezas	T. C. Bain.	Woodruff	G. B. Gardner.
Dudleyville	G. F. Cook.	Yuma (1)	Pac. Rwy. system.

LIST OF VOLUNTARY OBSERVERS, POST SURGEONS, ETC.—Continued.

Stations.	Observers.	Stations.	Observers.
Arkansas.		*California*—Cont'd.	
Alexander	J. Williams.	Colusa	J. D. McNary.
Conway	A. P. Robinson.	Corning	Pac. Rwy. system.
Dallas	T. M. Carder.	Crescent City	D. S. Sartwell.
Dayton	Dr. T. C. Miller.	Davis	Pac. Rwy. system.
El Dorado	W. B. Johnson.	Delano	Do.
Eureka Springs	A. H. Foote.	Delta	Do.
Heber	S. B. McMorris.	Downey	Do.
Helena (1)	George V. Warren.	Dunnigan	Do.
Hot Springs	U. S. post surgeon.	Dunsmuir	Do.
Lead Hill	Silas C. Turnbo.	Edgewood	Do.
Little Rock Barr'ks.	U. S. post surgeon.	El Dorado	Do.
Lonoke	W. H. Pyburn.	Elmira	Do.
Osceola	Alex. Goodrich.	El Verano	Do.
Ozone	George Bradley.	Emigrant Gap	Do.
Stuttgart	Dr. E. L. Buerkle.	Esperanza	Do.
Washington	A. H. Carrigan.	Evergreen	S. Holland.
Winslow	Albert Dunlap.	Farmington	Pac. Rwy. system.
		Felton	Do.
California.		Florence	Do.
		Folsom	Do.
Alcade	Pac. Rwy. system.	Fort Bidwell	U. S. post surgeon.
Alcatraz Island	U. S. post surgeon.	Fort Gaston	Do.
Almaden	Pac. Rwy. system.	Fort Mason	Do.
American Hill	T. L. Dwight.	Fort Ross	Oscar Call.
Anaheim	Pac. Rwy. system.	Fresno (2)	Pac. Rwy. system.
Anderson	Dr. A. Fouch.	Fruto	Do.
Angel Island	U. S. post surgeon.	Galt	Do.
Antioch	Pac. Rwy. system.	Georgetown	C. M. Fitzgerald.
Aptos	Do.	Gilroy	Pac. Rwy. system.
Arcata	H. L. Fry.	Girard	Do.
Athlone	Pac. Rwy. system.	Glen Ellen	Do.
Auburn	Do.	Goshen	Do.
Bakersfield	Do.	Grass Valley	Mr. Loutzenheiser.
Barstow	George R. Gooding.	Do	B. F. Berriman.
Beaumont	Pac. Rwy. system.	Hanford	Dr. W. H. Miller and A. E. Gribi.
Belmont	Do.		
Benicia Barracks	U. S. post surgeon.	Hollister	Pac. Rwy. system.
Berendo	Pac. Rwy. system.	Hornbrook	Do.
Berkeley	Prof. F. Soule.	Hydesville	E. T. Foss.
Bishop Creek	Pac. Rwy. system.	Indio	Pac. Rwy. system.
Boca	Do.	Ione	Do.
Borden	Do.	Iowa Hill	C. F. Macy.
Boulder Creek	Do.	Jolon	T. T. Tidball.
Brentwood	Do.	Julian	L. N. Bailey.
Brighton	Do.	Keeler (2)	Pac. Rwy. system.
Byron	Do.	Keene	Do.
Cactus	Do.	King City	Do.
Caliente	Do.	Kingsburgh	Do.
Calistoga	Do.	Knight's Landing	Do.
Campo	S. E. Gaskell.	La Grange	Jos. Dominici.
Castroville	Pac. Rwy. system.	Lathrop	Pac. Rwy. system.
Cedarville	Jackey and Brouillard.	Laurel	Do.
		Lemoore	Do.
Centreville	William Barry.	Lewis Creek	John Tuohy.
Chico	Pac. Rwy. system.	Livermore	Pac. Rwy. system.
Chino	John Wasson.	Livingston	Do.
Cisco	Pac. Rwy. system.	Lodi	J. D. Huffman.
Colegrove	Seward Cole.	Long Beach	Pac. Rwy. system.
Cole's	Pac. Rwy. system.	Los Angeles (2)	Do.
Colfax	Do.	Los Banos	A. Widman.
Colton	Do.	Los Gatos (1)	F. H. McCullagh.

LIST OF VOLUNTARY OBSERVERS, POST SURGEONS, ETC.—Continued.

Stations.	Observers.	Stations.	Observers.
California—Cont'd.		*California*—Cont'd.	
Los Gatos (2)	Pac. Rwy. system.	San Pedro	Pac. Rwy. system.
Mammoth Tank	Do.	Santa Ana	Do.
Martinez	Do.	Santa Barbara (1)	H. D. Vail.
Marysville (1)	Do.	Santa Barbara (2)	Pac. Rwy. system.
Marysville (2)	Daily Appeal.	Santa Clara	A. Block.
Mendocino	L. A. Morgan.	Santa Cruz	Pac. Rwy. system.
Menlo Park	Pac. Rwy. system.	Santa Margarita	Do.
Merced	Do.	Santa Maria	L. E. Blochman.
Modesto	Do.	Santa Monica	Pac. Rwy. system.
Mojave	Do.	Santa Paula	Do.
Montague	Do.	Santa Rosa	Do.
Monterey	Do.	Scott Valley	Isaac Titcomb.
Monterey (Hotel del Monte).	Do.	Selma	Pac. Rwy. system.
		Seven Palms	Do.
Mount Hamilton	Lick Observatory.	Shingle Springs	Do.
Napa (1)	W. H. Martin.	Sims	Do.
Napa (2)	Pac. Rwy. system.	Sisson	Do.
National City	J. E. Boal.	Soledad	Do.
Needles	Chas. O. Johnson.	Sonoma	Robert Hall.
Newark	Pac. Rwy. system.	Soquel	Pac. Rwy. system.
Newhall	Do.	South Side	Do.
Newman	Do.	South Vallejo	Do.
Niles	Do.	Spadra	Do.
Norwalk	Do.	Steeles	A. T. Mason.
Oakland (1)	Dr. J. B. Trembly.	Stockton (1)	W. W. Trivett.
Oakland (2)	Pac. Rwy. system.	Stockton (2)	Pac. Rwy. system.
Ontario	Do.	Suisun	Do.
Orland	Do.	Summit	Pac. Rwy. system.
Oroville	Hiram Arents.	Susanville	T. B. Sanders.
Pajaro	Pac. Rwy. system.	Sutter Creek	E. C. Voorheis.
Paso Robles	Do.	Tehachapi	Pac. Rwy. system.
Petaluma	Do.	Tehama	Do.
Placerville (1)	Do.	Templeton	Do.
Placerville (2)	Richard Rowland.	Towles	Do.
Pleasanton	Pac. Rwy. system.	Tracy	Do.
Pomona	Do.	Traver	Do.
Portersville	Do.	Tropico	Do.
Puente	Do.	Truckee	Do.
Red Bluff (2)	Do.	Tulare	Do.
Redding	Do.	Turlock	Do.
Riverside	W. E. Keith.	Upper Mattole	W. H. Roscoe.
Rocklin	Pac. Rwy. system.	Vacaville (1)	G. O. Coburn.
Rumsey	Do.	Vacaville (2)	Pac. Rwy. system.
Sacramento (1)	S. H. Gerrish.	Valley Springs (1)	Do.
Sacramento (2)	Pac. Rwy. system.	Valley Springs (2)	H. W. Turner.
Salinas (1)	Dr. E. K. Abbott.	Vina	Pac. Rwy. system.
Salinas (2)	Pac. Rwy. system.	Volcano Springs	Do.
Salton	Do.	Walla Walla Creek	Isaac Titcomb.
San Ardo	Do.	Walnut Creek	A. L. Bancroft.
San Bernardino	Sidney P. Waite.	West Butte	A. S. Noyes.
San Diego Bks (1)	U. S. post hospital.	Westley	Pac. Rwy. system.
San Fernando	Pac. Rwy. system.	Wheatland	William Lumbard.
San Francisco (Presidio of).	U. S. post surgeon.	Whittier	Pac. Rwy. system.
		Williams	Do.
San Gabriel	Pac. Rwy. system.	Willow (1)	David Bentley.
Sanger Junction	Do.	Willow (2)	Pac. Rwy. system.
San José	Do.	Winters	Do.
San Luis Obispo	J. E. Lewis.	Woodland (1)	Do.
San Mateo	Pac. Rwy. system.	Woodland (2)	J. B. Elston.
San Miguel	Do.	Yreka	Dr. L. Autenreith.

LIST OF VOLUNTARY OBSERVERS, POST SURGEONS, ETC.—Continued.

Stations.	Observers.	Stations.	Observers.
Colorado.		*Colorado*—Cont'd.	
Agate	L. Powell.	Saguache	J. W. Rambo.
Alma	W. H. Powless.	San Luis Exp. Sta.	H. H. Griffin.
Apishapa	Mrs. J. Rogers.	Sedgwick	J. D. Lucas.
Aspen	C. W. Thiele.	Springfield	G. W. Johnston.
Bennett	I. S. Putnam.	Stamford	Geo. Poehill.
Breckenridge	Dr. B. A. Arbogust.	Sun View	
Brush	Mrs. M. Leavitt.	Thon	P. Blumer.
Burlington	D. S. Harris.	T. S. Ranch	E. A. Rider.
Byers	F. S. Putnam.	Upper Pine	T. H. Halliday.
Cañon City	W. B. Felton.	Villa Grove	L. T. Durbin.
Cherry Creek	U. S. Geol. Survey.	Watkins	Agt. U. P. R. R.
Cheyenne Wells	L. N. McLane.	Wigwam	Joseph Irwin.
Climax	G. C. Wortman.		
Como (Ranch near).	A. Reichenecker.	*Connecticut.*	
Coulter	Jesse E. Glick.		
Deer Trail	C. G. Brown.	Birmingham	H. R. Stevens.
Delta	J. A. Curtis.	Canton	G. J. Cass.
Denver (2)	Rev. Wm. Forstall.	Clark's Falls	J. G. Perry.
Dolly Varden Mine.	C. L. Cass.	Colchester	S. P. Willard.
Eagle Farm	H. H. Griffin.	Falls Village	M. H. Dean.
Eastonville	H. G. Nichols.	Fort Trumbull	U. S. post surgeon.
Elkhorn	R. C. Boyle.	Hartford (1)	William R. Matson.
Emma	C. H. Mather.	Hartford (2)	J. Murtagh.
First View	C. Magee.	Hartford (3)	Rev. S. Hart.
Fort Collins	Prof. L. G. Carpenter.	Lake Konomoc	New London Water Works.
Fort Crawford	U. S. post surgeon.		
Fort Lewis	Do.	Lebanon	J. H. Tucker.
Fort Logan	Do.	Mansfield	E. A. Bailey.
Fort Lyons	Do.	Middletown	H. D. A. Ward.
Fraser	L. D. C. Gaskill.	New Britain	H. F. Wells.
Georgetown	Dr. W. A. Jayne.	New Hartford (1)	Rev. Wm. Goodwin.
Glenwood Springs	J. C. Kennedy.	New Hartford (2)	R. R. Smith.
Grand Lake	James Cairns.	Newington	T. A. Kirkham.
Greeley	E. Bethel.	North Woodstock	L. H. Healey.
Gunnison	D. McCann.	Pomfret	W. J. Bartholomew.
Hardin	E. B. Barnes.	Shelton	F. B. Wheeler.
Hugo	F. E. Hall.	Southington	Luman Andrews.
Husted	E. P. Moore.	South Manchester	K. B. Loomis.
Idaho Springs	W. B. Hawkins.	Thompson	Miss E. D. Larned.
Julesburg	H. M. Woodman.	Uncasville	W. H. Rathbone.
Kit Carson	Agent Union Pacific R. R.	Voluntown	Rev. E. Dewhurst.
		Wallingford	Mrs. B. F. Harrison.
Lamar	G. T. Herbert.	Waterbury	N. J. Welton.
La Porte	C. J. Gilkison.	West Simsbury	S. T. Stockwell.
Las Animas	W. E. Culver.		
Leadville	Dr. M. H. Sears.	*Delaware.*	
Livermore	G. E. Burnham.		
Longmont	Dr. E. J. Clark.	Kirkwood	William Carnagy.
Loveland	William Eisemann.	Newark	Prof. Geo. A. Harter.
Magnolia	P. Haigh.		
Middle Box Elder	E. F. Kerr.	*District of Columbia.*	
Monte Vista	C. J. Aldrich.		
Ouray	G. E. Kedzie.	Kendall Green	C. L. Washburn.
Palmer Lake	Dr. Thos. Gaddis.	Washington Barracks.	U. S. post surgeon.
Paoli	L. W. Jones.		
Parachute	L. S. Kelly.		
Platoro	C. W. Raymond.		
Platteville	G. W. Ressell.	*Florida.*	
Rifle Falls	W. L. Wilder.		
River Bend	Agent Union Pacific R. R.	Altamonte Springs.	M. E. Bingham.
		Alva	C. E. Robins.
Rocky Ford	F. Watrous.	Archer	A. F. Wyman.

LIST OF VOLUNTARY OBSERVERS, POST SURGEONS, ETC.—Continued.

Stations.	Observers.	Stations.	Observers.
Florida—Cont'd.		*Illinois*—Cont'd.	
Fort Barrancas	U. S. post surgeon.	Irishtown	William Rogan.
Fort Meade	A. H. Adams.	Jordan's Grove	W. J. S. Cathcart.
Homeland	J. S. Wade.	Kankakee	J. G. Knecht.
Kissimmee	E. E. W. Brewster.	Lacon	Rev. A. C. Price.
Lake City	Dr. J. C. Neal.	Lake Forest	L. R. F. Griffin.
Manatee	Mrs. M. W. Broberg.	Lanark	C. H. Beeler.
Matanzas	Mrs. B. E. Dupont.	Louisville	B. A. Jenkins.
Merritt's Island	Rev. J. H. White.	Martinsville	J. B. Sheapley.
St. Francis Barracks	U. S. post surgeon.	Mascoutah	Dr. G. Leibrock.
Tallahassee	Rev. W. H. Carter.	Mattoon	William Dozier.
Villa City	Rev. J. E. Round.	McLeansborough	William P. Gibbs.
		Mount Morris	William Feary.
Georgia.		Olney	Charles H. Fahs.
		Oneida	T. A. Wetmore.
Andersonville	H. W. Bryant.	Oswego	J. S. Seeley.
Athens	Prof. L. H. Charbonnier.	Ottawa	Dr. J. Q. Harris.
		Palestine	John E. Templeton.
Diamond	William Kimzey.	Pana	J. K. Eberle.
Duck	A. S. Gillespie.	Pekin	Rev. J. E. Terborg.
Forsyth	Thomas G. Scott.	Peoria	Dr. Fred. Brendel.
Fort McPherson	U. S. post surgeon.	Petersburgh	W. T. Stephenson.
Gillsville	C. W. Meaders.	Philo	H. A. Burr.
Hephzibah	R. L. Rhodes.	Pontiac	Isaac Young.
Marietta	G. S. Owen.	Quincy	C. H. Oakford.
Milledgeville	S. A. Cook.	Richview	A. G. Tucker.
Point Peter	C. M. Witcher.	Riley	John W. James.
Quitman (1)	J. L. Cutler.	Rockford	J. W. Budlong.
Thomasville (1)	C. S. Bondurant.	Rock Isl'd Arsenal	U. S. post surgeon.
Woolley's Ford	Hon. A. J. Julian.	Rushville	Nathan T. Veatch.
		Sandwich	Dr. N. E. Ballou.
Idaho.		Seneca	
		South Evanston	Dr. M. D. Ewell.
Boisé Barracks	U. S. post surgeon.	Sumner	J. A. Fyffe.
Era	Hervey Brooks.	Sycamore	Roswell Dow.
Fort Sherman	U. S. post surgeon.	Watseka	Henry Upsall.
Kootenai	David McLoughlin.	Wheaton	
Lewiston	Robert Schleicher.	White Hall	P. J. Bates.
Soda Springs	Dr. L. C. Eastman.	Willow Hill	
		Windsor	A. H. Hatch.
Illinois.		Winnebago	Frank Osborn.
		Woodstock	George D. Silliman.
Aledo	T. McWhorter.		
Atwood	J. W. C. Gray.	*Indiana.*	
Aurora (1)	W. Holden.		
Aurora (2)	Dr. M. M. Robins.	Angola	L. Stealy.
Beason	L. H. Sullivan.	Blue Lick	G. Poindexter.
Belvidere	E. L. Lawrence.	Butlerville	C. F. Hole.
Brush Hill	C. L. Farrington.	Cannelton	T. E. Huston.
Cedarville	John Wright.	Columbia City	Dr. N. I. Kithcart.
Centralia	J. L. Hallam.	Columbus	J. A. Perry.
Charleston	J. B. Dazey.	Connersville	R. Hessler.
Collinsville	Dr. J. L. R. Wadsworth.	Dana	J. E. Wright.
		Degonia Springs	J. P. White.
Dwight	H. D. Fisk.	Delphi	Higginbotham Son.
Fairfield	Jacob Hall.		
Flora	L. A. Michels.	Earl Park	Cleveland, Cincinnati, Chicago, and St. Louis R. R.
Fort Sheridan	U. S. post surgeon.		
Gibson City	W. C. Ball.		
Golconda	J. E. Y. Hanna.	Farmland	W. J. Davisson.
Greenville	Prof. M. S. Oudyn.	Franklin	D. A. Owen.
Griggsville	C. H. Oakford.	Huntertown	J. C. Hunter.
Hennepin	A. T. Purviance.	Huntingburgh	C. R. Kluger.

LIST OF VOLUNTARY OBSERVERS, POST SURGEONS, ETC.—Continued.

Stations.	Observers.
Indiana—Cont'd.	
Jeffersonville	J. C. Loomis.
Laconia	Lafe Crozier.
La Fayette (1)	Purdue University.
La Fayette (2)	Cleveland, Cincinnati, Chicago, and St. Louis R. R.
Lawrenceburgh	Do.
Lebanon	Do.
Marengo	J. M. Johnson.
Marion	S. R. Frankboner.
Mauzy	Elwood Kirkwood.
Mount Vernon	J. M. Lockwood.
Muncie	Stephen & Durham.
New Providence	Prof. E. S. Hallett.
Point Isabel	James F. Hood.
Princeton	Elisha Jones.
Richmond	E. J. Mote.
Rockville	A. C. Bates.
Salem	J. W. May.
Scalesville	Urias Wilson.
Seymour	John A. Forsythe.
Shelbyville	S. B. Morris.
Spiceland	William Dawson.
Sunman (1)	Dr. E. B. Vincent.
Sunman (2)	Cleveland, Cincinnati, Chicago and St. Louis R. R.
Vevay	Prof. C. G. Boerner.
Worthington	Dr. W. B. Squire.
Indian Territory.	
Caddo Creek	Dr. R. Leming.
Fort Gibson	U. S. post surgeon.
Fort Reno (2)	Do.
Fort Sill (2)	Do.
Fort Supply (2)	Do.
Guthrie	Morris Collar.
Jimtown	Dr. M. M. Yeakley.
Lehigh	F. M. Madden.
Oklahoma	C. F. Sommer.
Iowa.	
Alta	David E. Hadden.
Amana	Conrad Schadt.
Ames	J. Rush Lincoln.
Bancroft	H. N. Renfrew.
Belle Plaine	H. W. Vandike.
Blakeville	James Rogers.
Carroll	Moses Simon.
Carson	G. N. Ferguson.
Cedar Rapids	H. D. Olds.
Clarinda	A. S. Van Sandt.
Clinton	Luke Roberts.
Cresco	Gregory Marshall.
Cromwell	Harry C. Harrison.
Denmark	G. B. Brackett.
Des Moines (near)	Adolphus Voegeli.
Dunkerton	J. W. Boyle.
Dysart	Joseph Dysart.

Stations.	Observers.
Iowa—Continued.	
Eagle Grove	C. A. Schaffter.
Elkader	Mrs. J. N. Hamilton.
Fayette	R. Z. Latimer.
Fort Madison (near)	Miss L. A. McCready.
Gillett	H. W. Moore.
Glenwood (1)	Seth Dean.
Glenwood (2)	A. Schappel.
Grinnell	Prof. S. J. Buck.
Hampton	E. C. Gronelle.
Humboldt	Miss F. Prouty.
Independence	E. F. Wülfke.
Iowa City	Prof. A. A. Veblen.
Logan	Mrs. M. B. Stern.
McCausland	Miss R. Pearl Barr.
Manson	W. L. Thompson.
Maquoketa	Dr. A. B. Bowers.
Monticello	H. D. Smith.
Mount Pleasant	Dr. Max. E. Witte.
Mount Vernon	Prof. Alonzo Collin.
Muscatine	J. P. Walton.
Osage	G. D. Pattingill.
Osceola	F. M. Kyte.
Oskaloosa (1)	Joseph Boyd.
Oskaloosa (2)	O. H. Avey.
Sack City	Dr. Caleb Brown.
Storm Lake	A. J. Bond.
Vinton	T. F. McCune.
Washington	William A. Cook.
Webster City	C. M. Trumbauer.
Wesley	William Ward.
West Bend	Philip Dorweiler.
Kansas.	
Abilene	Aug. Miller.
Allison	J. J. Cass.
Arlington	B. P. Hanan.
Atwood	Albert Heming.
Augusta	F. E. Ellis.
Belleville	A. B. Graves.
Bendina	G. Campbell.
Brookville	J. Hogan.
Bucklin	Charles S. Culver.
Buffalo Park	H. G. Adams.
Bunker Hill	G. J. Knapp.
Burr Oak	H. E. Faidley.
Carneiro	J. C. Best.
Cawker City	A. G. Alrich.
Colby	C. E. Bennett.
Coldwater	J. M. Lobaugh.
Collyer	D. M. Brown.
Concordia (2)	H. A. Williams.
Conway	George Olivant.
Cunningham	E. Shaw.
Dorrance	F. G. Nichols.
Downs	J. B. Handy.
Dwight	William Taylor.
Elco	C. W. Gilman.
Elk Falls	Dr. A. C. Williams.
Ellis (1)	J. R. Reed.
Ellis (2)	F. E. Black.

LIST OF VOLUNTARY OBSERVERS, POST SURGEONS, ETC.—Continued.

Stations.	Observers.	Stations.	Observers.
Kansas—Cont'd.		*Kansas*—Cont'd.	
Ellsworth	J. S. Nicholson.	Seneca	Dr. S. S. Kaysbier.
Emporia	Prof. T. H. Dinsmore.	Sharon Springs	Agent Union Pacific R. R.
Englewood	C. D. Perry.	Shields	W. H. Harvey.
Fort Hays	U. S. post surgeon.	Stockton	B. L. Mickel.
Fort Leavenworth	Do.	Tribune	C. E. Wightman.
Fort Riley	Do.	Vesper	Wm. B. Cheney.
Fort Scott	W. W. Dillard.	Victoria	W. J. Holt.
Fremont (Atkin)	Edw. Atkin.	Wakeeney	J. S. Morton.
Gibson	C. M. Bell.	Wakefield	Wm. P. Cochran.
Globe	Wm. Featherston.	Walker	W. S. Radford.
Goguac	T. M. Grisson.	Walnut Grove	G. W. Hollenback.
Gorham	L. H. Holzer.	Wellington	John H. Wolfe.
Gove City	H. Woodcock.	Weskan	C. E. Teed.
Grainfield	E. A. Lewis.	Wilson	Agent Union Pacific R. R.
Grenola	R. M. Lawyer.	Winfield	W. J. Wilson.
Grinnell	E. P. Bradshaw.	Winona	J. S. Adams.
Halstead	D. C. Rath.	Yates Center	F. R. Gray.
Haven	G. W. Benson.	*Kentucky.*	
Havensville	L. W. Dennen.	Ashland	J. M. Ferguson.
Hays City	F. E. Black.	Bernstadt	Jno. de Planta.
Horton	W. S. Belden.	Bowling Green	M. H. Crump.
Hoxie	O. F. Ellithrope.	Canton	C. H. Major.
Hugoton	W. H. Rogers.	Earlington	J. B. Atkinson.
Independence	J. M. Altaffer.	Falmouth	F. G. Held.
Junction City	Prof. Robt. Hay.	Frankfort	E. C. Went.
Kanopolis	Agent Union Pacific R. R.	Franklin	T. W. McGill.
Kellogg	Jacob Nixon.	McHenry	W. G. Duncan.
La Harpe	Isaac S. Coe.	Madisonville	T. J. Gill.
Lakin	F. R. French.	Millersburgh	Rev. C. Pope.
Lawrence	Prof. F. H. Snow.	Mount Sterling	H. C. McKee.
Leavenworth Mil. Prison.	U. S. post surgeon.	Murray	James P. Jones.
Lebo	C. B. Jennings.	Newport Barracks	U. S. post surgeon.
Leoti	R. A. Ramey.	Owensborough	Watkins & Carter.
Lincoln	William Graves.	Owenton	James S. Cox.
Luray	W. H. Mead.	Pellville	Oscar Haynes.
McAllister	W. H. Parker.	Richmond	Prof. O. A. Kennedy.
Macksville	C. E. Poling.	Shelbyville	H. W. Preissler.
McPherson	F. T. Dunkle.	South Fork	A. B. Gilbert.
Manhattan (1)	C. M. Breese.	Springfield	Dr. W. W. Ray.
Manhattan (2)	C. P. Blachley.	*Louisiana.*	
Marmaton	A. C. Abbott.	Abbeville	Dr. C. J. Edwards.
Minneapolis	J. L. Steel.	Alexandria	L. C. Giffe.
Montero	W. F. Howe.	Amité City	Grace Manard.
Monument	J. W. Edwards.	Arcadia	Prof. J. M. Beeson.
Morse	R. P. Edgington.	Baton Rouge	Prof. B. B. Ross.
Ness City	L. E. Knowles.	Cameron	Hon. S. P. Henry.
Oakley	C. M. Kaufman.	Cheneyville	C. W. Owen.
Offerle	G. F. Tassell.	Clinton	J. A. White, jr.
Ogallah	Noah Yetter.	Convent	Prof. Frank Green.
Ottawa	Prof. O. C. Charlton.	Coushatta Chute	L. M. Howard.
Quinter	H. W. Hart.	Crowley	A. B. Goodrich.
Richfield	George H. Allen.	Donaldsonville	Paul Leche.
Rome	D. M. Adams.	Emilie (Mount Airy)	Dr. L. D. Chauff.
Russell	W. J. Hillyer.	Farmerville	W. P. Chandler.
Salina	J. H. Gibson.	Franklinton	Prof. J. M. Pugh.
Santa Fe	Judge R. P. Heminger.		
Scott City	S. P. Kane.		
Sedan	J. W. Goodell.		

LIST OF VOLUNTARY OBSERVERS, POST SURGEONS, ETC.—Continued.

Stations.	Observers.	Stations.	Observers.
Louisiana—Cont'd.		*Massachusetts.*	
Grand Cane	Prof. G. Williamson.	Amherst (1)	Miss S. C. Snell.
Grand Coteau	Rev. J. A. Raby, S. J.	Amherst (2)	Agricultural experiment station.
Hammond	W. A. Reed.	Amherst (3)	Hatch experiment station.
Houma	H. F. Belanger.	Beverly Farm	T. K. Lathrop.
Jackson Barracks	U. S. post surgeon.	Blue Hill (summit)	Prof. A. L. Rotch.
Jeanerette	G. W. Whitworth.	Blue Hill (base)	Do.
Jennings	Jno. R. Hunter.	Blue Hill (valley)	Do.
La Fayette	W. W. Wall.	Boston	Desmond Fitzgerald
Lake Charles	Dr. Wm. Meyer.	Brewster	Dr. F. A. Rogers.
Lake Providence	S. T. Le May.	Cambridge (1)	Harvard Col. Obs'y.
Liberty Hill	Dr. E. A. Crawford.	Cambridge (2)	E. C. Brooks.
Luling	F. M. Rogers.	Chestnut Hill	Desmond Fitzgerald
Mandeville	Alexander Baud.	Chicopee	F. H. Norton.
Marksville	Leon Molenar.	Clinton	G. W. Weeks.
Maurepas	Robert Benefield.	Cotuit	Gen. J. H. Reed.
New Iberia	Mrs. Jno. A. Gebert.	Deerfield (1)	Rev. A. Hazen.
Plaquemine	P. G. Kleinpeter.	Deerfield (2)	J. Childs.
Pointe à la Hache	F. C. Myers.	Dudley	Conant Observat'y.
Rayville	T. N. Rhymes.	Fall River (1)	C. V. S. Remington.
St. Joseph	J. S. D. Nowell.	Fall River (2)	P. Kiernan.
Shell Beach	E. De Champs.	Fiskdale	O. B. Truesdale.
Sugar Experiment Station.	T. H. Jones.	Fitchburg (1)	Dr. J. Fisher.
Thibodeaux	Maj. S. T. Grisamore.	Fitchburg (2)	Dr. A P. Mason.
Trinity	Hugh Watson.	Fort Warren	U. S. post surgeon.
Vidalia	L. P. Ault.	Framingham	Boston waterworks.
West Melville	L. J. Dodge.	Gilbertville	Dr. W. E. Brown.
Winnfield	J. M. McCain.	Groton	C. Woolley.
Maine.		Heath	B. B. Cutler.
Bar Harbor	Joseph Wood.	Holyoke	J. W. Doran.
Belfast	L. H. Murch.	Lake Cochituate	Boston waterworks.
Calais	Dr. D. E. Seymour.	Lawrence	Essex Co.
Cornish	Silas West.	Leicester	Arthur Kendrick.
Fairfield	H. H. Mansfield.	Long Plain	New Bedford waterworks.
Fort Preble	U. S. post hospital.	Lowell (1)	F. E. Saunders.
Gardiner	Henry Richards.	Lowell (2)	Prop. Locks and Canals.
Kennebec Arsenal	U. S. post surgeon.	Lowell (3)	Do.
Kent's Hill	Prof. W. C. Strong.	Lowell (4)	Merrimac Manufacturing Company.
Lewiston	Union Water Power Company.	Ludlow	M. W. Graves.
Mayfield	V. P. Hall.	Lynn	J. C. Haskell.
Orono	Prof. M. C. Fernald.	Mansfield	J. H. White.
Petit Manin	G. L. Upton.	Medford	R. M. Grow.
West Jonesport	C. Hopkins.	Middleborough	Middleborough waterworks.
Maryland.		Milton	Rev. A. K. Teele.
Barren Creek Springs.	A. E. Acworth.	Monson	Dr. G. E. Fuller.
Cumberland (1)	E. T. Shriver.	Mount Nonotuck	William Street.
Cumberland (2)	Howard Shriver.	Mystic Lake	Boston waterworks.
Fallston	Prof. G. G. Curtis.	Mystic Station (engine house).	Do.
Fort McHenry	U. S. post surgeon.	Mystic Station	Report of city engineer.
Frederick	McClintock Young.	Nahant	Dr. W. D. Hodges.
Gaithersburgh	John T. De Sellum.	Natick	
Galena	Henry Parr.	New Bedford (1)	New Bedford waterworks.
Gambrill's	J. E. Mogue.	New Bedford (2)	T. A. Rodman.
Jewell	Joseph Plummer.	Newburyport (1)	T. V. Pike.
McDonogh	McDonogh Institute		
Mount St. Mary's	Mount St. Mary's College.		
Woodstock	Woodstock College.		

LIST OF VOLUNTARY OBSERVERS, POST SURGEONS, ETC.—Continued.

Stations.	Observers.
Massachusetts—Continued.	
Newburyport (2)	Newburyport water works.
Northampton	J. M. Clark.
North Billerica	C. H. Kohlrausch.
Plymouth	Miss L. B. Knapp.
Princeton	Dr. R. H. Mansur.
Provincetown	J. R. Smith.
Randolph	E. D. Page.
Rowe	J. Davis.
Royalston	Miss L. W. Chase.
Salem (1)	J. P. Andrews.
Salem (2)	A. A. Smith.
Somerset	Elisha Slade.
South Hingham	H. W. Cushing.
Springfield (Nat'l Armory).	U. S. post surgeon.
Swampscott	W. Richardson.
Taunton (1)	Dr. E. W. Jones.
Taunton (2)	A. F. Sprague.
Taunton (3)	Taunton water-works.
Waltham	Boston Manufacturing Company.
Wellesley	Prof. Sarah F. Whiting.
Westborough	J. S. Newcomb.
Williamstown	Williams College Observatory.
Winchester	L. R. Symmes.
Worcester (1)	J. B. Hall.
Worcester (2)	R. Fobes.
Michigan.	
Adamsville	J. F. Emerson.
Adrian	W. H. Howard.
Albion (1)	William Boyd.
Albion (2)	Charles E. Barr.
Allegan	G. W. Griggsby.
Alma	P. M. Smith.
Ann Arbor	A. L. Colton.
Arbela	William Atkin.
Atlantic Mine	H. Obenhoff.
Ball Mountain	F. N. Hilton.
Bear Lake	D. J. McDiarmid.
Bell Branch	C. W. Cornwall.
Benton Harbor	Dr. H. V. Tutton.
Benzonia	C. T. Hopkins.
Berlin	R. O. Gould.
Berrien Springs	F. A. Zerby.
Big Rapids	F. R. Fowler.
Birmingham	S. Alexander.
Bronson	David Strachly.
Buchanan	C. F. Howe.
Calumet	E. S. Grierson.
Cassopolis	H. J. Webb.
Charlevoix	E. H. Green.
Chase	C. J. Wells.
Chelsea	Prof. A. Holt.
Clinton	D. Woodward.
Colon	George W. Teller.
Columbiaville	George H. Davis.
Michigan—Cont'd.	
Concord	Manley Shotwell.
Deer Lake	J. W. Ash.
East Saginaw	J. J. Granville.
East Tawas	S. B. Laird.
Eden	J. W. Chapin.
Evart	Mrs. H. A. Hepburn.
Fitchburgh	Menzo Conklin.
Flint	William L. Fisher.
Fort Brady	U. S. post surgeon.
Fort Mackinac	Do.
Fort Wayne	Do.
Fremont	C. I. Rathbun.
Gaylord	J. H. Scott.
Gladwin	Prof. F. C. Smith.
Grand Rapids	F. W. Ball.
Grape	J. W. Morris.
Grayling	O. Palmer.
Gulliver Lake	A. Beebe.
Hanover	L. B. Smith.
Harrisville	Dr. D. W. Mitchell.
Hart	F. H. Edwards.
Hastings	Dr. F. R. Timmerman.
Hayes	C. F. Leipptrandt.
Highland Station	A. D. De Garmo.
Hillman	James Francis.
Hillsdale	E. B. Rodgers.
Hudson	Maj. A. H. Boies.
Ionia	Roy M. Watkins.
Ivan	O. L. Giddings.
Jeddo	William Bice.
Kalamazoo	William A. Black.
Kenockee	William Mason.
Lansing (2)	Dr. H. B. Baker.
Lathrop	A. Lathrop.
Madison	H. C. Bradish.
Manchester	L. D. Watkins.
Marshall	Dr. G. H. Green.
May	Nelson Cody.
Mio	John Randall.
Montague	G. A. Whitbeck.
Mottville	J. A. Hartzler.
Noble	E. B. Bushnell.
North Adams	M. Foote.
North Aurelius	Harvey Wilson.
North Marshall	Perry Mayo.
Olivet	Prof. C. S. Richardson.
Otsego	Milton Chase.
Ovid	W. H. Taxon.
Paw Paw	J. C. Gould.
Petersburgh	Dr. S. L. Jones.
Pontiac	Henry M. Warren.
Pulaski	J. W. Hutchins.
Rawsonville	L. R. Brown.
Romeo	Prof. O. D. Thompson.
Roscommon	H. M. Heal.
St. Ignace	Rev. John Ferries.
St. John's	A. O. Hunt.
Sand Beach	Walton E. Nims.
Standish	James J. Decker.

LIST OF VOLUNTARY OBSERVERS, POST SURGEONS, ETC.—Continued.

Stations.	Observers.
Michigan—Cont'd.	
Stanton	Reuben C. Gardner.
Stockbridge	C. H. Force.
Thornville	Dr. J. S. Caulkins.
Traverse City (1)	S. E. Wait.
Traverse City (2)	Dr. Jas. D. Munson.
Vandalia	Amos Smith.
Vienna	M. M. McCormack.
Washington	Van W. Eaton.
Weldon Creek	J. J. Gelding.
West Branch	W. A. Weeks.
Williamston	J. H. Foster.
Ypsilanti (1)	J. C. Bemiss.
Ypsilanti (2)	C. S. Woodard.
Minnesota.	
Brainerd	Capt. A. E. Veon.
Crookston	John Ross.
Farmington	D. F. Akin.
Fort Snelling	U. S. post surgeon.
Grand Meadow	C. F. Greening
Lake Winnibigoshish Dam.	E. Cullen.
Leech Lake Dam	J. Ellingsen.
Le Sueur	L. B. Davis.
Mankato	D. R. Stockley.
Medford	Dr. J. D. Beeman.
Minneapolis	William Cheney.
Montevideo	Lloyd G. Moyer.
Morris	D. T. Wheaton.
Northfield	G. H. Alden.
Owatonna	C. E. Crane.
Pine River Dam	Neil Johnson.
Pokegama Falls	B. C. Finnegan.
Red Wing	Prof. O. Whitman.
Rolling Green	Capt. F. Wherland.
St. Charles	H. W. Hill.
Mississippi.	
Agricultural College.	J. M. White.
Booneville	A. G. Smith.
Canton	Dr. G. Smith-Vaniz.
Fayette	I. N. Bedford.
Greenville	R. Somerville.
Holly Springs	Dr. T. B. Shuford.
Kosciusko	Louis Heyman.
Lamar	A. W. Hull.
Loch Leven	W. H. Swan.
Logtown	Capt. C. D. Koch.
Louisville	B. T. Webster.
Macon (1)	A. T. Dent.
Palo Alto	W. H. Hill.
Pearlington	Dr. J. A. Mead.
Pontotoc	Dr. C. W. Bolton.
Rienzi	Dr. J. W. Stevens.
Ripley	E. N. Hunt.
Summit	J. N. Tennisson.
Water Valley	A. Erikson.
Waynesborough (1)	W. S. Davis.
Missouri.	
Carthage	Dr. J. G. Reaser.
Columbia	H. J. Waters.
Conception	Rev. Fr. Paul, S. J.
Craig	C. F. A. Day.
Excelsior Springs	A. Reinisch.
Fayette	Prof. T. Berry Smith.
Fox Creek	William Muir.
Frankford	W. W. Vermillion.
Glasgow	C. W. Pritchett.
Grand Pass	E. R. Graham.
Harrisonville	A. J. Sharps.
Ironton	W. H. Delano.
Jefferson Barracks	U. S. post surgeon.
Kansas City (2)	S. J. Spurgeon.
Kidder	F. D. Chubbeck.
Kirksville	Charles Patterson.
Lamonte	J. S. Slaven.
Langdon	J. L. Joslyn.
Mexico	Dr. J. F. Llewellyn.
Miami (1)	Robert Ruxton.
Miami (2)	Judge J. J. Ferril.
New Frankfort	G. W. Hawkins.
New Haven	Max Eimbeck.
Oak Ridge	Henry Bruthl.
Oregon	Mrs. Wm. Kaucher.
Ozark	B. C. Y. Brown.
Princeton	Dr. Wm. Hirons.
St. Charles (1)	Dr. J. R. Mudd.
St. Charles (2)	L. C. Saeger.
St. Louis (3)	Mrs. G. A. Weber.
St. Louis (2)	Prof. F. E. Nipher.
St. Louis (4)	Waterworks.
Savannah	R. Van Buskirk.
Sedalia	C. G. Taylor.
Shelbina	J. S. Chandler.
Springfield	E. F. Copp.
Steelville	E. A. Pinnell.
Troy	I. A. Ward.
Warrensburgh	Prof. G. L. Osborne.
Warrenton	J. H. Frick.
Willow Springs	William Hughes.
Wither's Mills	J. R. Dudley.
Montana.	
Camp Poplar River	U. S. post surgeon.
Fort Assinniboine (2)	Do.
Fort Custer (2)	Do.
Fort Keogh	Do.
Fort Logan	William Gaddis.
Fort Maginnis	U. S. post surgeon.
Fort Missoula	Do.
Fort Shaw	Do.
Glendive	J. H. Ray.
Powder River	J. M. Graham.
Sheldon	Mrs. S. E. Sheldon.
Virginia City	Eugene Stark.
Nebraska.	
Alliance	T. D. Shurtz.
Ansley	Peter Fowlie.

LIST OF VOLUNTARY OBSERVERS, POST SURGEONS, ETC.—Continued.

Stations.	Observers.
Nebraska—Cont'd.	
Ashland	George Shedd.
Bingham	W. C. Wood.
Brownville	G. D. Carrington.
Craig	E. F. Irwin.
Creighton	Dr. Geo. Roberts.
Crete (1)	G. I. Gilbert.
Culbertson	Mrs. L. A. Wibley.
David City	E. B. Taylor.
De Soto	Charles Seltz.
Fairbury	Dr. I. Humphrey.
Falls City	Robert Clegg.
Fort Niobrara	U. S. post surgeon.
Fort Robinson	Do.
Fort Sidney	Do.
Franklin	W. A. Harshbarger.
Fremont	J. E. Heaton.
Genoa	G. S. Truman.
Gering	J. P. Finley.
Grand Island	J. B. Moore.
Hay Springs	Wm. Waterman.
Howe	G. D. Carrington.
Kennedy	Mrs. M. G. Erickson.
Kimball	D. Henderson.
Lexington	J. M. Tipton.
Lincoln	University of Nebr.
Marquette	J. Pinkerton.
Minden	Joel Hull.
Nebraska City	J. B. Parmalee.
North Loup	E. W. Black.
Oakdale	G. S. Clingman.
Omaha Barracks	U. S. post hospital.
Palmer	C. Shieldstream.
Ravenna	E. Smith.
Red Willow	Mrs. R. Buck.
Sargent	J. S. Spooner.
Stratton	J. B. Slime.
Syracuse	P. W. Risser.
Tecumseh	W. L. Dunlap.
Weeping Water	G. Treat.
West Hill	J. L. Truman.
Weston	J. R. Campbell.
West Point	E. G. Bruner.
Nevada.	
Austin	Miss Bessie Taylor.
Battle Mountain	Pac. Rwy. system.
Belmont	John Reynolds.
Beowawe	Pac. Rwy. system.
Browns	Do.
Burner's Ranch	Prof. J. F. Burner.
Candelaria	W. H. Shockley.
Carlin	Pac. Rwy. system.
Carson City (2)	C. W. Friend.
Crane's Ranch	W. T. Crane.
Dayton	Prof. R. Lewers.
Downeyville	Dutton Fowler.
El Dorado Cañon	P. W. Davis.
Elko (1)	Pac. Rwy. system.
Elko (2)	C. H. Sproule.
Ely	J. F. Cupid.
Eureka	M. M. Ley.
Nevada—Cont'd.	
Fenelon	Pac. Rwy. system.
Ferguson's Ranch	J. W. Ferguson.
Fort McDermitt	U. S. post hospital.
Genoa	G. W. Dungan.
Golconda	Pac. Rwy. system.
Halleck	Do.
Hawthorne (1)	George Garrison.
Hawthorne (2)	Pac. Rwy. system.
Hot Springs	Miss L. Merrill. Pac. Rwy. system.
Humboldt	Samuel H. Kitto. Pac. Rwy. system.
Lewer's Ranch	Kate Lewers.
Mill City	J. A. Ferraro.
Montello	Pac. Rwy. system.
Palisade	J. L. Fast. Pac. Rwy. system.
Pioche	N. P. Dooley.
Punch Bowl	J. G. McMonnigal.
Reno (1)	Pac. Rwy. system.
Reno (2)	W. S. Devol. Prof. W. M. Miller.
Ruby Hill	W. B. Lawler.
St. Clair	L. Allen.
Sodaville	T. F. Keay.
Tecoma	Pac. Rwy. system
Toana	Do.
Tuscarora	Prof. M. D. Bowen.
Verdi	C. R. Carter.
Virginia City	Mark Averill.
Wadsworth	Pac. Rwy. system.
Wellington	A. C. Pratt.
Wells	Pac. Rwy. system.
Winnemucca (2)	Do.
New Hampshire.	
Antrim	F. W. Palmer.
Belmont Bristol Lake Village Weir's Bridge Wolfborough	Lake Winnipiseogee Cotton and Woolen Manufacturing Co.
Berlin Falls	O. F. Cole.
Berlin Mills	Q. A. Bridges.
Chesterfield	Miss A. E. Pierce.
Concord	W. L. Foster.
Hanover (1)	Prof. E. B. Frost.
Hanover (2)	New Hampshire Experiment Station.
Manchester (1)	S. D. Lord.
Manchester (2)	W. Little.
Mine Falls	Nashua Manufacturing Company.
Nashua	Charles H. Webster.
Newton	W. C. Gale.
North Conway	J. L. Binford.
North Sutton	C. E. Hosmer.
Pennichuck Station	Pennichuck Waterworks.
Plymouth	H. M. Clark.
Shaker Village	N. A. Briggs.

LIST OF VOLUNTARY OBSERVERS, POST SURGEONS, ETC.—Continued.

Stations.	Observers.
New Hampshire—Continued.	
Stratford	*N. B. Waters.*
Walpole	E. A. Knowlton.
West Milan	A. A. *Higgins.*
New Jersey.	
Allaire	H. Allaire.
Asbury Park	Rudolph Ross.
Beverley	Prof. C. F. Richardson.
Billingsport Light-House.	J. H. Preston.
Bridgeton	H. A. Jordan.
Cape May C. H	Dr. F. Leaming.
Egg Harbor City	H. Y. Postma.
Freehold	Miss A. S. Yard.
Gillette	R. N. Cornish.
Hanover	M. M. Cook.
Highland Park	E. W. *McGann.*
Hopewell	J. M. Dalrymple.
Imlaystown	Dr. *F. C. Price.*
Jersey City	Wright Babcock.
Lambertville	Dr. G. H. Larrison.
Locktown	G. W. Hockenbury.
Madison	John H. Eadie.
Moorestown	T. J. Beans.
Newark	F. W. Ricord.
New Brunswick (1)	*P. V. Spader.*
New Brunswick (2)	Dr. G. H. Cook.
New Brunswick (3)	*Prof. A. Scott.*
Ocean City	W. Lake.
Oceanic	Rev. S. W. Knipe.
Paterson	A. B. Wiggin.
Plainfield	Dr. M. S. Simpson.
Princeton	T. Reed.
Rancocas	S. Haines.
Readington	*J. Fleming.*
Somerville	A. C. Lindsley.
South Orange	*Dr. W. J. Chandler.*
Tenafly	A. D. Atwood.
Tom's River	*J. P. Haines.*
Trenton	E. R. Cook.
Union	F. L. Dunbar.
Valley	George Fleming.
Woodbury	W. T. Wilson.
New Mexico.	
Albuquerque	S. M. Rowe.
Antelope Spring	W. P. Mitcalf.
Cabezon	R. Haberland.
Cañon de Chama	W. C. Scott.
Coolidge	Mrs. E. Brown.
Deming	Pac. Rwy. system.
El Rito	*P. Jaramillo.*
Embudo	C. L. Pollard.
Fort Bayard	U. S. post *surgeon.*
Fort Marcy	Do.
Fort Seldon	Do.
Fort Stanton (1)	Do.
Fort Union	Do.
Fort Wingate	Do.
New Mexico—Cont'd.	
Gallinas Springs	J. E. Whitmore.
Good Hope	E. C. Sterling.
Hillsborough	J. E. Smith.
Jaquez	H. Jaquez.
Laguna	*R. Marmon.*
La Polvadera Tract	F. C. Peren.
Las Vegas	*F. W. Chatfield.*
Lordsburg	Pac. Rwy. system.
Los Lunas	Richard Pohl.
Magdalena	J. Johnson.
Monero	J. Bowie.
Nogal	J. M. Vega.
Pojuaque	John Boquet.
Red Cañon	*R. H. Hills.*
Rio Hondo	J. P. Ross.
San Marcial	A. A. Shaw.
San Marcial (near)	N. M. Meridian.
San Pedro	V. Schick.
Taos	W. Adair.
Tres Piedras	E. C. Sterling.
Wallace	J. L. Morris.
New York.	
Alfred Centre	*F. S. Place.*
Angelica	J. P. Slocum.
Arcade	Homer W. Clough.
Ardenia	R. B. Arden.
Auburn	George Casey.
Barnes' Corners	W. C. Tawdrey.
Boyd's Corners	Thomas Manning.
Brooklyn	Prof. W. C. Peckham.
Canton	Prof. Henry Priest.
Carmel	Thomas Manning.
Constableville	R. Sanford Miller.
Cooperstown	G. Pomeroy Keese.
David's Island	U. S. post surgeon.
Eden Centre	W. P. Hunt.
Elmira	Gerity Brothers.
Factoryville	T. P. Yates.
Fleming	*Robert Warwick.*
Fort Columbus	U. S. post surgeon.
Fort *Hamilton*	Do.
Fort Niagara	Do.
Fort Porter	Do.
Fort Schuyler	Do.
Fort Wadsworth	Do.
Friendship	Jesse D. Rogers.
Geneva	Mrs. N. S. Yates.
Hess Road Station	C. H. Spaulding
Honeymeadbrook	James Hyatt.
Humphrey	*Chas E.* Whitney.
Ilion	G. A. Trowbridge.
Ithaca	Engineering department, Cornell University.
Kingston	Henry A. Stone.
Le Roy	Prof. F. M. Comstock.
Lowville	W. H. Stephens.
Lyons	*Dr. M. A.* Veeder.
Madison Barracks	U. S. post surgeon.

LIST OF VOLUNTARY OBSERVERS, POST SURGEONS, ETC.—Continued.

Stations.	Observers.
New York—Cont'd.	
Middleburgh	F. X. Straub.
Mount Morris	J. E. White.
Newfane	F. B. Clark.
New York (Central Park).	Prof. D. Draper.
Nineveh	W. J. Barnett.
North Hammond	C. A. Wooster.
Number Four	Charles Fenton.
Palermo	E. B. Bartlett.
Palmyra	L. D. Cummings.
Pendleton Centre	William D. Lovell.
Perry City	W. H. Jeffers.
Plattsburgh Barracks.	U. S. post surgeon.
Potsdam	Peter Vilas and G. W. F. Smith.
Queensbury	De Witt C. Jenkins.
Rome	Dr. H. C. Sutton.
Salem	William W. Hance.
Saranac Lake	James P. Mills.
Savona	Dr. M. S. Collier.
Setauket	Selah B. Strong.
Somerset	J. W. Thurber.
South Canisteo	James E. Wilson.
S. E. Reservoir	T. Manning.
South Kortright	D. C. Sharpe.
Tannersville	Dr. H. M. Wilson.
Turin	R. T. Church.
Utica	Thomas Birt.
Watervliet Arsenal	U. S. post surgeon.
Wedgwood	O. F. Corwin.
West Point	U. S. post surgeon.
White Plains	Prof. O. R. Willis.
Willets Point	U. S. post surgeon.
North Carolina.	
Asheville	Dr. Karl von Ruck.
Chapel Hill	Prof. J. W. Gore.
Clarkton	M. E. Mears.
Clear Creek	H. C. Dunn.
Fayetteville	H. R. Horne.
Franklin	Lee Crawford.
Grover	F. H. Dover.
Highlands	Dr. F. G. Harbison.
Hot Springs	Dr. W. F. Ross.
Lenoir	Dr. R. L. Beall.
Monroe	D. C. Anderson.
Morganton	Dr. P. S. Murphy.
Mount Airy	Jos. W. Ashby.
Mount Pleasant	H. L. T. Ludwig.
Pittsborough	Prof. A. McIver.
Raleigh	T. C. Harris.
Salisbury	Jno. A. Hedrick.
Smithfield	R. D. Luneford.
Soapstone Mount'n.	H. L. Kimrey.
Southern Pines	H. W. Lloyd.
Statesville	W. A. Eliason.
Wake Forest	Prof. E. G. Beckwith.
Washington	Jas. M. Gallagher.
Weldon	T. A. Clark.
Winslow	J. C. Williams.
North Dakota.	
Carrington	H. M. Durbrow.
Davenport	J. W. Leech.
Fort A. Lincoln	U. S. post surgeon.
Fort Buford (1)	Do.
Fort Pembina	Do.
Fort Totten	Do.
Fort Yates (1)	Do.
Gallatin	S. J. Pound.
Napoleon	J. H. Hoof.
New England City	E. S. Clough.
Steele	F. R. Hill.
Wahpeton	C. J. Craft.
Ohio.	
Akron	Buchtel College.
Ashland	Dr. P. H. Clark.
Athens	Prof. A. D. Morrill.
Bangorville	S. M. Painter.
Beallsville	Prof. D. McVay.
Bellevue	W. E. Sheffield.
Bement	P. W. Burton.
Canton	C. F. Stokey.
Carrollton	Peter M. Herold.
Celina	Prof. W. F. McDaniel.
Circleville	H. Renick.
Clarksville	E. T. M. Williams.
Cleveland (1)	G. A. Hyde.
College Hill	Jno. W. Hammitt.
Collinwood	William Smeed.
Columbus Barracks	U. S. post surgeon.
Dayton	Mrs. E. E. L. Boyer.
Demos	B. R. Ault.
Ellsworth	D. A. Allen.
Elyria	C. W. Goodspeed.
Findlay	Prof. A. C. Redding.
Fostoria	George M. Fink.
Garrettsville	S. M. Luther.
Georgetown	Dr. T. W. Gordon.
Granville	J. Sanford.
Gratiot	W. B. Longstreth.
Greenville	C. G. Katzenberger.
Hanging Rock	James Bull.
Hiram	Prof. G. H. Colton.
Hudson	Prof. N. B. Hobart.
Jacksonborough	Dr. J. B. Owsley.
Jefferson	Judge E. C. Wade.
Kent	P. W. Eigner.
Kenton	L. J. Demarest.
Leipsic	J. D. Hadermann.
Logan	Dr. James Little.
Lordstown	W. S. Dean.
McConnelsville	C. H. Morris.
Marietta (2)	Prof. T. D. Briscoe.
Napoleon	Dr. T. C. Hunter.
New Alexandria	Jos. A. Hook.
New Athens	Jos. Holmes.
New Comerstown	Dr. A. M. Beers.
North Lewisburgh	H. D. Gowey.
Oberlin	Prof. F. F. Jewett.
Ohio State Univ'ty	W. H. Baker.
Orangeville	E. U. Hyde.

LIST OF VOLUNTARY OBSERVERS, POST SURGEONS, ETC.—Continued.

Stations.	Observers.
Ohio—Continued.	
Ottawa	L. E. Holtz.
Poland	Charles Stewart.
Pomeroy	Dr. D. N. Allard.
Portsmouth	Dr. D. B. Cotton.
Salineville	J. W. Manning.
Shanesville	John Roth.
Shiloh	Peter Bowman.
Sidney	Ed. Pence.
Springborough	Mrs. Ruth Ellis.
Tiffin	Rev. T. H. Sonedecker.
Upper Sandusky	Dr. A. Billhardt.
Vienna	M. D. McCorkle.
Wapakoneta	Prof. C. W. Williamson.
Wauseon	Thomas Mikesell.
Waverly	David Lorbach.
Waynesville	E. B. Michener.
Westerville	Prof. Jno. Haywood.
West Milton	Luke S. Motte.
Weymouth	Dr. F. Young.
Wooster	Dr. O. N. Stoddard.
Yellow Springs	Miss Eliza G. Rice.
Youngstown	A. G. Frost.
Oregon.	
Albany	John Briggs.
Ashland (1)	Pac. Rwy. system.
Ashland (2)	F. L. Carter.
Bandon	George Bennett.
Beulah	Thomas L. Arnold.
Cascade Locks	Lieut. E. Burr.
Corvallis	State Agricultural College.
Creswell	M. C. Close.
East Portland	Dr. George Wigg.
Eola	Thomas Pierce.
Fort Klamath	U. S. post surgeon.
Gardiner	J. S. Gray.
Grant's Pass	Dr. Jno. G. Jessup.
Heppner	Arthur Smith.
Hood River	Dr. E. J. Thomas.
Jacksonville	Peter Britt.
La Grande	J. K. Romig.
Lone Rock	W. H. Colwell.
McMinnville	Capt. Wyatt Harris.
Mount Angel	Rev. Fr. Barnabas Held.
St. Helens	Jno. McDonald.
Siskiyou	Pac. Rwy. system.
The Dalles	Samuel L. Brooks.
Tillamook	A. P. Wilson.
Vernonia	G. W. Dallas.
Pennsylvania.	
Allegheny Arsenal	U. S. post surgeon.
Altoona	Charles B. Dudley.
Annville	Prof. G. W. Bowman.

Stations.	Observers.
Pennsylvania—Continued.	
Aqueduct	D. M. Shelley.
Bethlehem	Lerch and Rice.
Blooming Grove	John Grathwohl.
Blue Knob	A. H. Boyle.
Cannonsburgh	A. L. Runyon.
Carlisle	J. E. Pague.
Catawissa	Robert M. Graham.
Chambersburgh	Miss M. A. Ricker.
Charlesville	Miss E. A. G. Apple.
Clarion (State Normal School).	Prof. C. M. Thomas.
Coatesville	W. F. Gordon.
Corry	William Loveland.
Coudersport	C. L. Peck.
Doylestown	T. H. Walton.
Drifton	H. D. Miller.
Dyberry	Theodore Day.
Eagle's Mere	E. S. Chase.
Easton	Dr. J. W. Moore.
Edinborough	C. F. Sweet.
Emporium	T. B. Lloyd.
Forks of Neshaminy	J. C. Hilsman.
Frankford Arsenal	U. S. post surgeon.
Franklin	Joseph Bell.
Frederick	G. W. Wood.
Germantown	Thomas Meehan.
Girardville	E. C. Wagner.
Grampian Hills	Nathan Moore.
Greenville	Prof. S. H. Miller.
Hollidaysburgh	Prof. J. A. Stewart.
Honesdale	John Torrey.
Huntingdon	Prof. W. J. Swigart.
Indiana	Prof. S. C. Schmucker.
Johnstown	E. C. Lorentz.
Kennett Square	Benjamin P. Kirk.
Lancaster	E. E. Weller.
Lansdale	H. L. Shull.
Le Roy	G. W. T. Warburton
Lock Haven	Prof. J. A. Robb.
McConnellsburgh	Thomas F. Sloan.
Meadville	David Logan.
Meshoppen	Stephen S. Jenkins.
Myerstown	W. H. Kline.
New Bloomfield	Frank Mortimer.
New Castle	W. T. Butz.
Nesbit	John S. Gibson.
Ottsville	C. F. Heavener.
Petersburgh	J. E. Rooney.
Philipsburgh	G. F. Dunkle.
Pleasant Mount	John D. Brennan.
Point Pleasant	R. C. Stover.
Pottstown	Charles Moore.
Quakertown	J. L. Heacock.
Reading	C. M. Dechant.
Rimersburgh	Rev. W. W. Deatrick.
Salem Corners	Dr. T. B. Orchard.
Seisholtzville	J. A. Roth.
Selin's Grove	J. M. Boyer.

LIST OF VOLUNTARY OBSERVERS, POST SURGEONS, ETC.—Continued.

Stations.	Observers.	Stations.	Observers.
Pennsylvania—Continued.		*South Dakota*—Continued.	
Smethport	Armstrong and Brownell.	Brookings	Prof. L. McLouth.
Smith's Corners	George Lowder.	Canton	Wm. M. Cappett.
Somerset	W. M. Schrock.	Clark	W. H. Boals.
South Eaton	B. M. Hall.	De Smet	Thomas H. Ruth.
State College	Agricultural Experiment Station.	Fort Bennett	U. S. post surgeon.
Swarthmore	Prof. Susan J. Cunningham.	Fort Meade	Do.
Tionesta	R. L. Haslet.	Fort Randall	Do.
Tipton	Miss Cora J. Wilson.	Fort Sisseton	Do.
Troy	M. Gustin.	Fort Sully (1)	Do.
Tuscarora	R. J. Mickey.	Garden City	W. C. T. Newell.
Uniontown	William Hunt.	Kimball	A. S. Stuver.
Wellsborough	H. D. Deming.	Onida	Mrs. M. F. Goddard.
West Chester	Dr. Jesse C. Green.	Parkston	John J. Swartz.
Westtown	Prof. W. F. Wickersham.	Roscoe	C. H. Spencer.
Wilkes-Barre	A. W. Batterly.	Spearfish	J. H. Warren.
Wysox	Charles Beecher.	Spring Lake	A. Gould.
York	Mrs. L. H. Grenewald.	Webster	Arthur Betts.
		Wolsey	G. W. Frink.
		Woonsocket	L. O. Libbey.
Rhode Island.		*Tennessee.*	
Bristol	N. G. Herreshoff.	Andersonville	J. K. P. Wallace.
Fort Adams	U. S. post surgeon.	Ashwood	Rev. C. F. Williams.
Kingston (1)	C. O. Flagg.	Austin	P. B. Calhoun.
Kingston (2)	N. Helme.	Bolivar	H. C. Calahan.
Lonsdale	G. W. Pratt.	Clarksville	Prof. Jas. A. Lyon.
Newport	T. Dunn.	Cog Hill	Dr. A. Slack.
Olneyville	C. H. Cannon.	Covington	James I. Hall.
Pawtucket	J. H. Walker.	Cumberland Gap	Alex. A. Arthur.
Providence (1)	City engineer.	Dunlap	Lewis Boynton.
Providence (2)	D. Hoyt.	Fayetteville	J. C. Diemer.
Woonsocket	Water works.	Florence Station	C. F. Vanderford.
		Fostoria	Robert Foster.
		Greenville	W. H. Brown.
		Grief	Miss Belle Baker.
South Carolina.		Hohenwald	R. Downey.
		Jacksboro	W. C. Hall.
Aiken	Dr. W. H. Geddings.	Kingston	H. M. Young.
Belmont	W. G. Peterson.	Kingston Springs	W. J. Inman.
Brewer Mine	E. L. Woeltze.	Lawrenceburgh	J. A. Laughlin.
Cedar Springs	J. F. Bayerly.	Leeville	Dr. Jos. A. Rogers.
Clinton	W. S. Lee.	Lewisburgh	A. B. Ewing.
Columbia (1)	Prof. M. Whiting.	Lookout Mountain	G. S. Porter.
Conway	M. P. Daggett.	Lynnville	J. H. Burrow.
Evergreen	J. W. Earl.	McKenzie	C. Hawkins.
Kirkwood	Colin Macrae.	McMinnville	J. P. Clark.
Newberry	E. H. Ault.	Milan (2)	Dr. M. D. L. Jordan.
Port Royal	H. D. Elliott.	Nunnelly	W. C. Thompson.
Simpsonville	Miss N. L. Dawson.	Parksville	J. C. Williamson.
Statesburgh	Dr. W. W. Anderson.	Riddleton	F. K. Fergusson.
Timmonsville	H. L. Moore.	Rogersville	S. M. Millers, M. D.
Trial	E. Gillard.	Rugby	Dr. W. F. G. Wilson.
Walhalla	H. G. Reid.	Savannah	H. R. Hinkle.
Winnsborough	James Pagan.	Springdale	W. J. Breeding.
Yorkville	J. R. Schorb.	Trenton	A. S. Currey.
		Tullahoma	E. S. Jones.
South Dakota.		Watkins	W. E. Watkins.
		Waynesborough	Dr. C. Buchanan.
Alexandria	W. S. Hill.	Woodstock	C. W. Graves.
Armour	John J. Angus.		

LIST OF VOLUNTARY OBSERVERS, POST SURGEONS, ETC.—Continued.

Stations.	Observers.	Stations.	Observers.
Texas.		*Utah*—Continued.	
Austin (1)	Oscar Samostz.	Fort Douglas	U. S. post surgeon.
Austin (2)	Dr. Q. C. Smith.	Fort Du Chesne (1)	Do.
Baird	D. Richardson.	Kelton	Pac. Rwy. system.
Bear Creek	W. H. Potter.	Levan	A. B. Larson.
Brady	Do.	Losee	E. Caffall.
Brazoria	H. Stevens.	Moab	Henry Crouse.
Brenham	J. G. Sloan.	Mount Carmel	Robert Moncre.
Brownwood	J. T. Mayo.	Mount Pleasant	Hans C. Davidson.
Burnett	Wm. M. Spittler.	Nephi	W. R. May.
Camp Eagle Pass	U. S. post surgeon.	Ogden (1)	Pac. Rwy. system.
Camp Peña Colorado.	Do.	Ogden (2)	Bell Telephone Co.
		Park City	Do.
Cedar Hill	J. P. Berry.	Promontory	Pac. Rwy. system.
Cleburne	P. J. Norwood.	Provo	Bell Telephone Co.
Coldwater	J. W. O'Brian.	Richfield	Neils Anderson.
College Station	Duncan Adriance.	St. George	Seth A. Pymm.
Colorado	F. R. Blount.	Stockton	Bell Telephone Co.
Corsicana	W. H. Hamilton.	Terrace	Pac. Rwy. system.
Decatur	H. D. Donald.		
Durham	A. Blum.	*Vermont.*	
Duval	J. C. Edgar.		
Epworth	Horatio Graves.	Brattleboro (1)	W. H. Childs.
Forestburgh	J. N. Morris.	Brattleboro (2)	H. B. Chamberlain.
Fort Bliss	U. S. post surgeon.	Burlington	W. B. Gates.
Fort Brown	Do.	Chelsea	H. L. Bixby.
Fort Clark	Do.	Cornwall	C. H. Lane.
Fort Concho	Do.	Coventry	W. H. Tibbetts.
Fort Davis	Do.	East Berkshire	H. B. Lovering.
Fort Elliott (1)	Do.	Hartland	Rev. A. Hazen.
Fort Hancock	Do.	Jacksonville	J. W. Hatch.
Fort McIntosh	Do.	Lunenburgh	Dr. H. A. Cutting.
Fort Ringgold	Do.	Manchester	Rev. E. P. Wild.
Fort Worth	J. G. Mallette.	St. Johnsbury	F. Fairbanks.
Fredericksburgh	A. Striegler.	Saxton's River	W. T. Paine.
Gainesville	D. F. Ragsdale.	Strafford	H. F. J. Scribner.
Gallinas Springs	Lum Woodruff.	Vernon	A. Whithead.
Graham	A. B. Gant.		
Hartley	C. F. Conklin.	*Virginia.*	
La Grange	Jos. Cottam.		
Lampasas	C. M. Ramsdell.	Alum Springs	Prof. F. H. Campbell.
Menardville	Louis Runge.		
Merkel	J. L. Vaughan.	Bird's Nest	C. R. Moore.
Mesquite	S. G. Lackey.	Bolar	George F. Eakle.
New Braunfels	Paul Wipprecht.	Christiansburgh	H. D. Walters.
New Ulm	C. Runge.	Dale Enterprise	L. J. Heatwole.
Panhandle	James L. Gray.	Fort Monroe	U. S. post surgeon.
Panter	E. H. Snider.	Fort Myer	Do.
Pecos City	C. H. Merriman.	Lexington	Prof. H. D. Campbell.
Round Rock	W. Weiss.		
San Antonio (1)	U. S. post surgeon.	Marion	A. T. Lincoln.
Silver Falls	C. M. Tilford.	Middletown	A. G. Prior.
Snyder	A. C. Wilmeth.	Mossingford	R. V. Gaines.
Temple	W. G. Jones.	Nottoway C. H	George Dunn.
		Petersburgh	James M. Colson, jr.
Utah.		Richmond	W. H. Pleasants.
		Smithfield	J. A. Purdee.
Alta	Bell Telephone Co.	Spottsville	B. W. Jones.
Beaver	Rev. J. D. Gillilan.	Summit	John R. Sim.
Bingham	Bell Telephone Co.	University of Virginia.	James Wearmouth.
Blue Creek	Pac. Rwy. system.		
Corinne	Do.	Wytheville	Howard Shriver.

LIST OF VOLUNTARY OBSERVERS, POST SURGEONS, ETC.—Continued.

Stations.	Observers.	Stations.	Observers.
Washington.		*Wisconsin*—Cont'd.	
Blakeley	R. M. Hoskinson.	Glasgow	H. M. Crombie.
Fort Canby (2)	U. S. post surgeon.	Grantsburgh	Dr. M. L. Robey.
Fort Spokane	Do.	Greenwood	H. J. Thomas.
Fort Townsend	Do.	Hayward	J. M. Custard.
Fort Vancouver	Do.	Honey Creek	J. A. McIntosh.
Fort Walla Walla	Do.	Lincoln	A. J. Looze.
Vashon Island	Mrs. C. B. Carpenter.	Madison	Washburne Observatory.
		Manitowoc	Miss Johanna Liips.
West Virginia.		Neillsville	William Heaslett.
		Oshkosh	Prof. W. Mumper.
Clarksburgh	R. T. Lowndes.	Richland Centre	Dr. H. M. Ludwig.
Ella	Henry Resseger.	Summit Lake	E. S. Koepenick.
Kingwood	J. E. Murdock.	Viroqua	F. J. Bold.
Parkersburgh	T. G. Field.	Wauconsta	G. H. Yapp.
Pleasant Hill	Daniel Titchenell.	Wausau	Heinemann Bros.
Rivesville	I. J. Parsons and F. F. Prickett.	Wauzeka	C. Rice.
		Weston	U. H. Anderson.
Rowlesburgh	M. J. Coniff.		
Seven Pines	J. N. Sharer.		
Tannery	G. H. Trembly.	*Wyoming.*	
Tyler Creek	F. M. Swann.		
		Camp Pilot Butte	U. S. post surgeon.
Wisconsin.		Fort Bridger	Do.
		Fort D. A. Russell	Do.
Cadiz	B. C. Curtis.	Fort Laramie (2)	Do.
Delavan	George L. Collie.	Fort McKinney (1)	Do.
Embarrass	J. E. Breed.	Fort Sheridan	Do.
Fond du Lac	J. C. Wedge.	Fort Washakie (1)	Do.
Fredonia	B. H. Meyer.	Lusk	F. S. Lusk.
Friendship	J. M. Harrison.	Wheatland	M. R. Johnston.

APPENDIX 16.

DATES OF THE FIRST AND LAST KILLING FROST FOR THE SEASON 1889-'90.

[Compiled from reports of Signal Service and voluntary observers.]

States and stations.	First.	Last.
Alabama:		
Auburn	Nov. 29	Mar. 18
Bermuda	Nov. 30	Mar. 17
Citronelle	....	Mar. 16
Columbiana	Nov. 29	Mar. 17
Double Springs	....	Mar. 17
Livingston	Nov. 29	Mar. 17
Mobile	Nov. 29	Mar. 17
Montgomery	Nov. 29	Mar. 17
Valley Head	Oct. 8	Mar. 17
Wiggins	....	Mar. 17
Arizona:		
Ash Springs	....	Feb. 23
Agua Caliente	....	Feb. 28
Banghart's	Oct. 12	....
Crittenden	Nov. 4	....
Eagle Pass	....	Mar. 15
Flagstaff	Sept. 28	....
Florence	Nov. 7	Mar. 12
Fort Bowie	Dec. 30	Apr. 2
Fort Apache	Oct. 25	Apr. 21
Fort Grant	Nov. 2	Apr. 2
Fort McDowell	Nov. 7	Feb. 15
Fort Thomas	Oct. 30	Mar. 13
Fort Verde	Nov. 2	Mar. 16
Globe	Oct. 31	....
Holbrook	Nov. 25	Apr. 21
Lochiel	Nov. 3	Mar. 21
Mount Huachuca	Nov. 5	Mar. 14
Phœnix	(2)	Feb. 28
San Carlos	Nov. 2	Mar. 13
Signal	Nov. 7	Mar. 10
Tombstone	Nov. 5	....
Tucson	Dec. 29	Mar. 13
Whipple Barracks	Oct. 10	Apr. 21
Wilcox	Nov. 6	Apr. 3
Williams	Sept. 16	....
Winslow	Nov. 6	....
Yuma	(2)	Jan. 14
Arkansas:		
Forrest City	....	Mar. 6
Fort Smith	Oct. 27	Mar. 16
Lead Hill	Oct. 7	....
Little Rock	Nov. 28	Mar. 16
Winslow	Nov. 13	Mar. 5
California:		
American Hill	Dec. 27	....
Anderson	Nov. 15	....
Barstow	Nov. 6	Mar. 14
Eureka	Dec. 12	Mar. 11
Ferndale	....	Jan. 8
Fresno	Dec. 21	Apr. 14
Georgetown	Dec. 13	Mar. 31
Hydesville	Sept. 12	Apr. 14
California—Cont'd.		
Iowa Hill	Dec. 27	Mar. 11
Jolon	....	Jan. 26
Julian	....	Feb. 27
Keeler	Nov. 14	Mar. 27
La Grange	....	Feb. 28
Lewis Valley	....	Jan. 20
Los Angeles	(2)	Jan. 20
Los Banos	....	Feb. 22
Mendocino	....	Mar. 11
Mount Hamilton	....	Apr. 9
Needles	Dec. 31	....
Pasadena	....	Feb. 28
Placerville	....	Mar. 31
Point Reyes Light	(2)	Jan. 7
Red Bluff	Dec. 27	Feb. 28
Riverside	Dec. 30	Mar. 10
Sacramento	(2)	Feb. 27
San Diego	(2)	Jan. 15
San Francisco	Dec. 14	Jan. 7
Santa Clara	Nov. 29	....
Santa Maria	Dec. 28	....
Steele's	....	Jan. 15
Susanville	Oct. 10	Apr. 1
Upper Mattole	Nov. 5	....
Vacaville	Dec. 29	Feb. 27
Walla Walla Creek	Nov. 4	Apr. 22
Walnut Creek	Dec. 15	Feb. 27
Wheatland	Dec. 29	Feb. 28
Willow	Dec. 11	Mar. 11
Colorado:		
Colorado Springs	Sept. 25	May 15
Coulter	Sept. 6	....
Delta	Sept. 14	Apr. 23
Denver	Sept. 15	May 15
Fort Collins	Sept. 4	May 15
Fruita	....	May 13
Georgetown	....	May 15
Grand Lake	Aug. 20	....
Greeley	Sept. 24	....
Montrose	Sept. 15	May 13
Palmer Lake	Sept. 15	May 14
Pike's Peak	Aug. 21	....
Pueblo	Oct. 20	Apr. 27
Rocky Ford	Sept. 25	Apr. 3
San Luis Valley	....	June 7
Connecticut:		
Hartford	Oct. 18	Apr. 19
Meriden	....	Apr. 19
New Hartford	Oct. 3	Apr. 25
New Haven	Oct. 17	Apr. 19
New London	Nov. 16	Apr. 19
Southington	Oct. 9	Apr. 26
Voluntown	....	Apr. 29

[2] No frost prior to January 1, 1890.

DATES OF THE FIRST AND LAST KILLING FROST FOR THE SEASON 1889-'90—Cont'd.

States and stations.	First.	Last.
Delaware:		
Kirkwood	Oct. 23	Mar. 19
District of Columbia:		
Washington	Oct. 9	Apr. 6
Florida:		
Archer	Nov. 29	Mar. 17
Cedar Keys	(2)	Mar. 3
Homeland	....	Mar. 17
Jacksonville	Nov. 30	Mar. 17
Jupiter	(3)	(3)
Key West	(3)	(3)
Lake City	Nov. 19	Mar. 17
Madison	....	Mar. 17
Manatee	....	Mar. 17
Matanzas	....	Mar. 16
Micco	(2)	Mar. 3
Nama (Alva)	....	Mar. 17
Pensacola	Nov. 30	Mar. 16
Pine Level	....	Mar. 17
Tallahassee	Nov. 29	Mar. 17
Titusville	(2)	Mar. 17
Villa City	....	Mar. 17
Georgia:		
Andersonville	Oct. 8	Mar. 6
Athens	Nov. 29	Mar. 17
Atlanta	Nov. 29	Mar. 17
Augusta	Nov. 29	Mar. 17
Camilla	Nov. 29	....
Diamond	Nov. 29	Mar. 17
Duck	Oct. 7	....
Forsyth	Nov. 29	Mar. 16
Gillsville	Nov. 29	Mar. 17
Hephzibah	Nov. 29	Mar. 16
Marietta	Oct. 8	Mar. 17
Milledgeville	Nov. 29	Mar. 17
Millen	....	Mar. 17
Monticello	Nov. 29	Mar. 16
Perry	Nov. 30	Mar. 17
Point Peter	Nov. 29	Mar. 17
Quitman	Nov. 29	Mar. 17
Savannah	Nov. 30	Mar. 16
Thomasville	Nov. 19	Mar. 17
Woolley's Ford	Nov. 28	Mar. 17
Idaho:		
American Falls	....	May 28
Beaver	....	June 13
Boisé City	Sept. 11	Apr. 15
Bonanza	....	June 28
Eva	Sept 11	June 21
Henry's Lake	....	May 11
Kootenai	Sept. 14	Apr. 28
Mullan	....	June 4
Payette	....	June 2
Soda Springs	....	June 28
Illinois:		
Aurora	Sept. 27	May 11
Cairo	Oct. 7	Mar. 16
Charleston	....	May 6
Chicago	Sept. 27	Apr. 14
Cockrell	....	Apr. 4
Collinsville	Nov. 5	Apr. 1
Louisville	....	Apr. 10

States and stations.	First.	Last.
Illinois—Continued.		
Mattoon	Sept. 27	....
Mount Morris	Sept. 18	....
Oneida	Oct. 14	....
Oswego	Sept. 21	May 16
Palestine	Oct. 7	Apr. 1
Peoria	Oct. 7	May 6
Philo	Sept. 27	May 11
Riley	Sept. 18	Apr. 10
Rockford	Sept. 27	May 6
Sandwich	Oct. 7	....
South Evanston	Sept. 18	....
Springfield	Oct. 7	May 7
Sycamore	Sept. 27	Apr. 10
Windsor	Oct. 7	....
Indiana:		
Butlerville	Oct. 7	....
Cannelton	....	Apr. 1
Crandall	....	May 7
Dana	Sept. 19	....
Indianapolis	Oct. 7	Apr. 1
Jeffersonville	Oct. 7	Mar. 23
Mauzy	Sept. 21	Apr. 1
Point Isabel	Sept. 21	May 12
Scalesville	Oct. 7	....
Sunman	Oct. 7	Apr. 19
Terre Haute	Dec. 24	(1)
Valparaiso	....	May 10
Vevay	Sept. 28	Apr. 28
Indian Territory:		
Caddo Creek	....	Mar. 16
Fort Reno	Oct. 26	Mar. 31
Fort Sill	Nov. 9	Mar. 16
Fort Supply	Sept. 25	May 16
Guthrie	....	Mar. 16
Healdton	....	Mar. 2
Jimtown	Nov. 2	....
Iowa:		
Alta	....	May 7
Amana	Sept. 27	May 17
Ames	Sept. 19	May 7
Bancroft	Sept. 18	May 17
Belle Plaine	Sept. 19	May 5
Blakeville	Sept. 27	May 16
Carroll	Sept. 27	May 16
Carson	Oct. 20	May 7
Cedar Rapids	Sept. 27	May 16
Clarinda	Oct. 20	Apr. 17
Clinton	Sept. 27	May 16
Cresco	Sept. 17	May 20
Davenport	Sept. 27	May 6
Des Moines	Sept. 27	May 16
Dubuque	Sept. 27	May 6
Eagle Grove	Oct. 6	May 7
Elkader	Sept. 18	Apr. 17
Fayette	Sept. 16	May 20
Fort Madison	Sept. 27	Apr. 9
Gillett	Sept. 17	....
Glenwood	Sept. 27	May 7
Grinnell	Sept. 27	....
Hampton	Sept. 17	May 17
Humboldt	Sept. 17	May 17
Independence	....	Apr. 1

[1] Station closed before last frost was to be expected.
[2] No frost prior to January 1, 1890.
[3] No frost during season.

DATES OF THE FIRST AND LAST KILLING FROST FOR THE SEASON 1889-'90—Cont'd.

States and stations.	First.	Last.
Iowa—Continued.		
Indianola	....	May 7
Iowa City	Oct. 28	May 6
Irwin	....	May 16
Jefferson	Sept. 17	....
Keokuk	Sept. 27	Apr. 10
Larrabee	....	Apr. 14
Logan	Sept. 18	May 7
Manson	Sept. 18	May 16
Maquoketa	Sept. 27	May 5
McCausland	Sept. 27	Mar. 31
McGregor	Sept. 18	....
Monticello	Sept. 19	May 20
Mount Pleasant	Sept. 27	....
Osage	Sept. 27	May 5
Oskaloosa	Sept. 27	Apr. 10
Sac City	Sept. 17	May 16
Sioux City	Oct. 6	May 7
Storm Lake	Oct. 5	May 4
Vinton	Sept. 19	....
Washington	Sept. 27	Apr. 10
Webster City	Sept. 17	May 16
Wesley	Sept. 16	May 17
West Bend	Sept. 17	....
Kansas:		
Allison	Oct. 20	May 7
Alton	....	May 7
Bendena	Nov. 5	....
Cairo	....	Mar. 4
Concordia	Sept. 27	May 7
Cunningham	Oct. 26	May 16
Dodge City	Sept. 25	Apr. 27
Downs	....	May 7
Elk Falls	Nov. 7	....
Emporia	Oct. 6	May 16
Englewood	Oct. 26	Apr. 1
Fremont	Sept. 24	May 7
Globe	Oct. 27	Apr. 1
Gove City	....	Apr. 27
Havensville	Oct. 20	Apr. 1
Independence	Oct. 27	Mar. 31
Kansas City	....	May 16
La Harpe	Nov. 9	May 16
Lawrence	Oct. 27	....
Leavenworth	Oct. 27	Apr. 1
Lebo	Sept. 27	May 16
Leoti	....	May 6
Macksville	....	May 16
Manhattan	Sept. 27	May 16
Morse	Oct. 27	Apr. 1
Salina	....	Apr. 10
Sedan	Oct. 27	Mar. 31
Topeka	Oct. 6	May 7
Tribune	Sept. 25	May 6
Wellington	Oct. 26	....
Wichita	Oct. 27	Apr. 1
Yates Center	Oct. 27	Apr. 27
Kentucky:		
Ashland	Oct. 8	
Bowling Green	Oct. 7	Apr. 1
Canton	Oct. 8	Mar. 30
Earlington	Oct. 6	Mar. 28
Falmouth	Oct. 7	....
Kentucky—Cont'd.		
Frankfort	Oct. 7	Apr. 11
Franklin	Oct. 8	Mar. 16
Harrodsburgh	....	May 8
Lexington	Oct. 7	Apr. 1
Louisville	Oct. 7	Mar. 31
Millersburgh	Oct. 7	Mar. 16
Mount Sterling	Oct. 7	Apr. 1
Murray	Oct. 7	....
Owenton	Oct. 7	Apr. 11
Pellville	....	Apr. 11
Princeton	....	Mar. 29
Richmond	Oct. 7	Apr. 11
Shelbyville	Oct. 5	Apr. 11
South Fork	Oct. 7	Apr. 11
Springfield	Oct. 7	....
Louisiana:		
Audubon Park	....	Mar. 4
Cameron	Nov. 9	Mar. 3
Cheneyville	....	Mar. 3
Columbia	Nov. 4	....
Coushatta	....	Mar. 3
Emilie	....	Mar. 4
Girard	....	Mar. 2
Grand Coteau	Nov. 29	Mar. 3
Houma	Nov. 18	Mar. 4
La Fayette	....	Mar. 3
Liberty Hill	Oct. 27	....
Luling	Nov. 18	Mar. 15
Marksville	Oct. 27	Mar. 14
Minden	....	Mar. 3
New Orleans	(2)	Mar. 2
Shreveport	Nov. 29	Mar. 3
Maine:		
Cornish	Oct. 5	Apr. 19
Eastport	Oct. 24	Apr. 27
Farmington	Oct. 15	Apr. 26
Gardiner	Oct. 17	....
Kent's Hill	Oct. 17	May 2
Orono	Sept. 30	May 2
Portland	Oct. 11	Apr. 19
Maryland:		
Baltimore	Nov. 6	Apr. 2
Barren Creek Springs	Oct. 9	May 9
Cumberland	Sept. 22	Apr. 6
Fallston	Oct. 9	....
Frederick	Oct. 24	Apr. 2
Gaithersburgh	Oct. 23	Apr. 1
Galena	....	Apr. 19
Gambrill's	Oct. 21	....
Jewell	Nov. 16	Apr. 2
McDonogh	....	Apr. 19
Mount St. Mary's College	Oct. 9	Apr. 19
Woodstock	Oct. 9	Apr. 21
Massachusetts:		
Amherst	Sept. 23	May 17
Boston	Nov. 17	Apr. 19
Brewster	....	Apr. 18
Cambridge	Oct. 17	Apr. 19
Chestnut Hill	Oct. 17	Apr. 26
Dudley	Oct. 3	Apr. 30

[2] No frost prior to January 1, 1890.

DATES OF THE FIRST AND LAST KILLING FROST FOR THE SEASON 1889-'90—Cont'd.

States and stations.	First.	Last.	States and stations.	First.	Last.
Massachusetts—Con.			Mississippi—Cont'd.		
Fall River	Oct. 17	Apr. 26	Pearlington	Nov. 29	....
Heath	Sept. 29	May 17	Pontotoc	Nov. 11	Mar. 29
Leicester	Sept. 23	Apr. 20	Port Gibson	....	Mar. 16
Ludlow	....	Apr. 29	Summit	Nov. 11	Mar. 14
Milton	Oct. 3	May 12	University	Nov. 28	Mar. 16
Nahant	....	Apr. 19	Vaiden	....	Mar. 17
Nantucket	Nov. 16	Apr. 19	Vicksburg	Nov. 18	Mar. 16
New Bedford	Oct. 23	Apr. 19	Washington	....	Mar. 16
Newburyport	Oct. 17	Apr. 23	Waynesborough	Nov. 18	Mar. 17
North Billerica	Oct. 5	Apr. 26	West Point	....	Mar. 16
Provincetown	Oct. 19	....	Missouri:		
Royalston	Oct. 21	Apr. 19	Appleton City	....	May 16
Somerset	Oct. 11	Apr. 26	Bethany	....	Apr. 10
Taunton	Oct. 8	Apr. 26	Brunswick	Oct. 6	Apr. 1
Vineyard Haven	Oct. 8	Apr. 19	Centreville	....	May 8
Williamstown	Oct. 3	May 2	Conception	Oct. 21	May 5
Wood's Holl	Nov. 16	Apr. 19	Excelsior Springs	Sept. 27	May 16
Worcester	Oct. 8	Apr. 19	Fayette	Oct. 15	May 16
Michigan:			Frankford	Oct. 7	....
Albion	Sept. 21	May 10	Glasgow	Sept. 27	May 16
Alpena	Sept. 22	May 16	Grand Pass	Oct. 27	May 16
Berrien Springs	Oct. 7	Apr. 1	Harrisonville	Oct. 27	....
Birmingham	Sept. 22	May 7	Ironton	Oct. 7	Apr. 1
Caldwell	....	May 24	Kansas City	Oct. 27	Apr. 1
Detroit	Sept. 27	May 11	Lamar	....	May 6
Escanaba	Sept. 27	May 20	Liberty	....	May 16
Grand Haven	Sept. 22	May 1	New Frankford	Oct. 29	May 16
Harrisville	Sept. 16	June 7	New Haven	....	Apr. 1
Hudson	Sept. 20	June 7	Oregon	....	May 16
Kalamazoo	Sept. 19	May 11	Ozark	Sept. 6	Apr. 1
Lansing	Sept. 22	May 11	Pickering	....	May 16
Manistee	Sept. 22	May 1	Platte River	....	May 16
Marquette	Sept. 21	May 22	Princeton	Oct. 20	May 7
Marshall	Sept. 22	May 11	Protem	Oct. 27	....
Mottville	Sept. 22	May 16	St. Charles	....	May 6
Port Huron	Sept. 14	May 11	St. Louis	Oct. 7	Apr. 1
Sault de Ste. Marie	Sept. 22	May 18	Sarcoxie	....	May 16
Thornville	Sept. 22	May 7	Sedalia	Oct. 27	....
Ypsilanti	Sept. 20	May 11	Shelbina	....	May 16
Minnesota:			Springfield	Oct. 6	Apr. 1
Duluth	Oct. 7	May 17	Steeleville	Sept. 19	....
Grand Meadow	Sept. 18	....	Warrensburgh	Oct. 27	....
Le Sueur	Sept. 18	Apr. 14	Willow Springs	Sept. 26	Apr. 10
Montevideo	Sept. 18	May 26	Montana:		
Moorhead	Sept. 15	May 20	Blackfeet Agency	....	May 29
Morris	....	May 17	Fort Assiniboine	Sept. 11	May 15
St. Charles	....	May 5	Fort Custer	Sept. 13	May 12
St. Paul	Sept. 27	May 17	Fort Logan	Aug. 28	June 15
St. Vincent	Aug. 4	May 27	Fort Maginnis	Sept. 11	June 12
Sheldon	Sept. 27	May 17	Glendive	Sept. 14	May 15
Mississippi:			Helena	Sept. 11	May 12
Booneville	....	Mar. 16	Martinsdale	....	May 27
Columbus	....	Mar. 17	Powder River	Sept. 11	May 15
Edwards	....	Mar. 16	Sheldon	Sept. 11	Apr. 12
Fayette	Nov. 18	Mar. 16	Virginia City	Sept. 11	May 28
Kosciusko	....	Mar. 16	Nebraska:		
Lake	....	Apr. 10	Alliance	Oct. 4	June 7
Logtown	....	Mar. 4	Ansley	Sept. 15	....
Louisville	Oct. 8	Mar. 29	Ashley	....	May 14
Meridian	Oct. 8	Mar. 16	Bingham	Sept. 24	....
Moss Point	Nov. 29	Mar. 3	Creighton	Sept. 18	May 7
Palo Alto	....	Mar. 17	Crete	Sept. 27	May 7

DATES OF THE FIRST AND LAST KILLING FROST FOR THE SEASON 1889-'90—Cont'd.

States and stations.	First.	Last.	States and stations.	First.	Last.
Nebraska—Cont'd.			New York—Cont'd.		
Culbertson	Sept. 25	May 7	Ardenia	Oct. 23	Apr. 19
De Soto	Sept. 27	May 16	Auburn	Oct. 23	....
Fairbury	Oct. 18	....	Boyd's Corners	Oct. 24	May 9
Falls City	Oct. 20	....	Buffalo	Oct. 21	May 11
Fremont	Oct. 6	May 7	Canton	Oct. 3	May 21
Genoa	Oct. 6	May 13	Constableville	Oct. 12	June 8
Gering	Sept. 15	May 12	Cooperstown	Oct. 19	May 18
Hay Springs	Oct. 2	May 15	Eden Center	....	May 2
Howe	Sept. 27	May 7	Elmira	Oct. 19	May 2
Kennedy	Oct. 19	Apr. 8	Factoryville	Oct. 3	May 18
Kimball	Sept. 5	May 15	Fleming	Oct. 14	May 21
Leighton	....	May 7	Geneva	Oct. 21	May 8
Lincoln	Oct. 13	....	Hess Road Station	Sept. 23	May 21
Marquette	....	May 7	Honeymead-brook	Oct. 19	....
North Loup	Sept. 14	May 15	Humphrey	Sept. 23	May 18
North Platte	Sept. 15	May 7	Ilion	Sept. 23	May 18
Omaha	Sept. 27	May 7	Ithaca	Oct. 16	May 2
Syracuse	Oct. 18	Apr. 1	Lowville	....	May 21
Tecumseh	....	May 16	Lyons	Oct. 21	May 18
Valentine	Sept. 15	May 13	New Lisbon	....	May 9
Weeping Water	Sept. 27	May 7	New York City	Oct. 22	Apr. 19
Nevada:			Nineveh	Oct. 3	....
Carson City	Sept. 15	June 3	North Hammond	Oct. 10	May 2
Winnemucca	Sept. 12	May 12	Number Four	Sept. 23	May 21
New Hampshire:			Ogdensburgh	....	May 8
Antrim	Sept. 22	....	Oswego	Oct. 19	May 2
Berlin Mills	Oct. 14	....	Palermo	Sept. 23	May 21
Concord	Oct. 22	May 12	Palmyra	Oct. 21	May 2
Hanover	....	May 23	Pendleton Centre	Oct. 6	May 11
Manchester	Oct. 9	May 29	Perry City	Oct. 15	May 12
Nashua	....	May 12	Queensbury	Sept. 23	May 21
North Sutton	Oct. 17	Apr. 19	Rochester	Oct. 18	May 2
Shaker Village	Sept. 29	May 7	Rome	Sept. 22	....
New Jersey:			Rondout	Sept. 23	....
Atlantic City	Nov. 6	Apr. 19	Saranac Lake	Sept. 23	....
Beverly	Oct. 8	May 9	Savona	Sept. 23	....
Egg Harbor City	Oct. 22	May 9	Schoharie	Oct. 5	May 9
Jersey City	Nov. 16	....	Setauket	....	Apr. 19
Moorestown	Oct. 17	Apr. 6	South Canisteo	Sept. 23	May 21
Readington	Nov. 16	Apr. 19	South Kortright	Sept. 23	May 19
South Orange	Oct. 17	Apr. 9	Tannersville	Oct. 3	....
Woodbury	Oct. 22	Apr. 6	Turin	....	May 21
New Mexico:			Utica	Sept. 23	May 21
Albuquerque	....	Mar. 17	Wedgwood	Oct. 15	....
Chama	....	June 5	White Plains	Oct. 3	Apr. 19
Coolidge	Sept. 23	May 22	North Carolina:		
Fort Stanton	Sept. 26	Apr. 22	Asheville	Oct. 7	Apr. 21
Gallinas Springs	Nov. 1	Apr. 3	Chapel Hill	Nov. 19	Apr. 20
Hillsborough	....	Apr. 3	Charlotte	Oct. 8	Mar. 17
La Luz	....	Apr. 3	Hatteras	(²)	Mar. 16
Las Vegas	Sept. 25	May 14	Highlands	Sept. 19	....
Lava	Oct. 30	Apr. 9	Kitty Hawk	Nov. 30	Mar. 17
Los Lunas	Nov. 4	Mar. 12	Lenoir	Oct. 1	Apr. 21
Red Cañon	....	Apr. 10	Morganton	Oct. 7	Apr. 11
Roswell	Oct. 24	Apr. 10	Mount Airy	Oct. 9	Apr. 21
Santa Fé	Sept. 25	Apr. 25	Mount Pleasant	Oct. 8	Apr. 21
New York:			New Berne	....	Apr. 11
Albany	Oct. 22	Apr. 26	Oak Ridge	....	Apr. 20
Alfred Centre	Oct. 5	....	Raleigh	Nov. 20	Apr. 20
Angelica	Sept. 23	May 21			
Apalachin	....	May 18			

[2] No frost prior to January 1, 1890.

DATES OF THE FIRST AND LAST KILLING FROST FOR THE SEASON 1889-'90—Cont'd.

States and stations.	First.	Last.	States and stations.	First.	Last.
North Carolina--Con.			Oregon—Continued.		
Soapstone Mount.	Nov. 7	Apr. 21	Grant's Pass	Nov. 4	Apr. 25
Southport	Nov. 29	Mar. 16	Happy Valley	....	June 4
Washington	....	Mar. 16	Heppner	Sept. 11	May 30
Weldon	Sept. 9	Apr. 21	Jordan Valley	....	June 19
Wilmington	Nov. 29	Apr. 20	Joseph	....	June 4
North Dakota:			Klamath	(4)	(1)
Bismarck	Sept. 26	May 15	La Grande	Oct. 28	....
Davenport	Sept. 15	Mar. 21	Lakeview	....	June 25
Fort Buford	Sept. 11	May 26	Linkville	Aug. 19	(1)
Fort Yates	Sept. 15	May 15	McMinnville	Nov. 3	Apr. 15
Gallatin	Sept. 15	May 17	Mount Angel	Oct. 15	Apr. 15
Grand Forks	....	Mar. 21	Portland	Nov. 16	Apr. 14
Napoleon	Sept. 15	....	Roseburgh	Nov. 6	Apr. 15
New England City	Sept. 5	Mar. 26	Tillamook	Dec. 5	....
Steele	Sept. 15	Mar. 17	Pennsylvania:		
Wahpeton	Sept. 14	Mar. 18	Altoona	Oct. 22	Apr. 20
Ohio:			Aqueduct	Oct. 24	Apr. 19
Bellevue	Oct. 7	May 2	Blooming Grove	Oct. 22	Apr. 19
Bement	Sept. 18	May 12	Blue Knob	Oct. 5	May 21
Carrollton	Oct. 7	May 20	Corry	Sept. 23	May 18
Cincinnati	Oct. 8	Apr. 1	Dyberry	Sept. 23	May 18
Cleveland (1)	Oct. 24	May 2	Easton	....	Apr. 19
Cleveland (2)	Oct. 8	May 2	Edinborough	Sept. 23	May 21
College Hill	Oct. 7	....	Erie	Oct. 21	Apr. 20
Columbus	Oct. 7	Apr. 19	Franklin	Oct. 9	May 2
Demos	Oct. 3	May 2	Germantown	Oct. 24	....
Elyria	Oct. 8	May 7	Grampian Hills	Sept. 23	May 7
Garrettsville	Sept. 23	May 21	Harrisburg	Oct. 22	Apr. 19
Gratiot	....	May 8	Le Roy	Oct. 5	May 18
Hassan	....	May 11	Lewistown	....	May 2
Jacksonborough	....	May 11	Nisbet	Oct. 24	May 1
Kent	Sept. 27	May 5	Petersburgh	Sept. 24	May 12
Kenton	Oct. 7	May 11	Philadelphia	Oct. 22	Apr. 19
Leipsic	Oct. 7	May 11	Philipsburgh	Sept. 23	May 18
Lordstown	Oct. 9	....	Pittsburgh	Oct. 24	Apr. 19
Napoleon	Sept. 21	May 11	Pleasant Mount	Oct. 7	Apr. 27
New Athens	Oct. 7	....	Quakertown	Oct. 3	May 17
North Lewisburgh	Oct. 7	May 2	Reading	Oct. 9	....
Orangeville	Sept. 21	May 17	Salem Corners	Oct. 19	May 9
Poland	Oct. 8	....	State College	Oct. 3	May 2
Portsmouth	Oct. 8	Apr. 11	Tipton	....	May 7
Sandusky	Oct. 8	Apr. 21	Troy	Oct. 9	May 18
Shanesville	Oct. 8	....	Tuscarora	Oct. 22	May 19
Shiloh	Sept. 22	May 11	Wellsborough	Sept. 23	May 28
Tiffin	Sept. 21	May 11	West Chester	Oct. 23	Apr. 19
Toledo	Oct. 8	Apr. 21	Rhode Island:		
Vienna	Oct. 8	May 21	Block Island	Dec. 28	Apr. 19
Wauseon	Sept. 21	May 11	Kingston	Oct. 11	Apr. 26
Westerville	Sept. 22	May 2	Narragansett Pier.	Oct. 3	Apr. 8
West Milton	Oct. 7	Apr. 20	South Carolina:		
Yellow Spring	Sept. 21	....	Aiken	Nov. 29	Mar. 17
Oregon:			Charleston	Nov. 30	Mar. 16
Albany	Nov. 4	Apr. 15	Cheraw	....	Mar. 17
Astoria	Nov. 15	Apr. 13	Columbia	Nov. 29	Mar. 17
Baker City	Sept. 4	June 2	Greenwood	....	Mar. 17
Bandon	Nov. 15	Mar. 31	Kirkwood	Dec. 1	Mar. 17
Beulah	Sept. 11	June 19	Port Royal	Nov. 30	Mar. 16
Burns	....	June 17	Simpsonville	Nov. 19	Apr. 11
Ellensburgh	....	Mar. 11	Spartanburgh	Nov. 19	May 8
Eola	Nov. 14	Apr. 23	Statesburgh	Nov. 29	Apr. 11

[1] Station closed before last frost was to be expected.
[4] Frost every month during observation.

DATES OF THE FIRST AND LAST KILLING FROST FOR THE SEASON 1889-'90—Cont'd.

States and stations.	First.	Last.	States and stations.	First.	Last.
South Dakota:			Texas—Continued.		
Aberdeen	....	June 7	Gallinas	Nov. 9	....
Alexandria	Sept. 16	May 16	Galveston	(²)	Mar. 1
Brookings	Sept. 15	May 16	Graham	Nov. 3	Mar. 16
Canton	Sept. 17	....	Hartley	Sept. 25	Apr. 27
Clark	Sept. 17	May 16	Hearne	....	Mar. 3
De Smet	Oct. 14	....	Howe	Nov. 17	Mar. 15
Etta Mine	....	May 12	Huntsville	....	Mar. 2
Flandreau	....	May 17	La Grange	Nov. 9	Mar. 1
Fort Sully	Oct. 17	May 15	Lampasas	Nov. 10	Mar. 2
Highmore	....	May 19	Menardville	Nov. 12	Mar. 3
Huron	Oct. 5	May 15	Merkel	....	Mar. 6
Kimball	Oct. 5	May 15	Mesquite	Oct. 27	Mar. 16
Millbank	....	May 5	New Braunfels	Nov. 17	Mar. 15
Oelrichs	....	May 15	New Ulm	Nov. 29	Mar. 2
Onida	....	May 25	Ochiltree	Nov. 2	Apr. 3
Parkston	Sept. 15	May 15	Palestine	Nov. 13	Mar. 2
Rapid City	Sept. 15	May 13	Panhandle	Nov. 2	Apr. 9
Roscoe	Sept. 17	....	Panter	Nov. 12	Mar. 1
Spearfish	Sept. 15	May 15	Pecos City	Nov. 9	....
Vermillion	....	May 7	Rio Grande City	(²)	Mar. 2
Webster	Sept. 15	May 18	Round Rock	Oct. 27	....
Wolsey	Sept. 15	May 15	San Antonio	Nov. 17	Mar. 2
Woonsocket	Sept. 15	May 16	Sartartia	Nov. 12	....
Yankton	Oct. 5	May 5	Silver Falls	Nov. 2	Apr. 1
Tennessee:			Tyler	....	Mar. 8
Ashwood	Oct. 8	Mar. 17	Waco	....	Mar. 1
Austin	Oct. 8	Apr. 11	Utah:		
Chattanooga	Nov. 28	Mar. 17	Beaver	Sept. 15	June 5
Cumberland Gap	....	Apr. 11	Fort Du Chesne	Sept. 15	May 13
Dyersburgh	....	Mar. 29	Grouse Creek	....	June 4
Knoxville	Oct. 8	Mar. 17	Lake Park	....	Apr. 14
Memphis	Nov. 29	Mar. 16	Losee	Oct. 26	June 21
Milan	Oct. 7	Mar. 29	Moab	Oct. 28	....
Nashville	Oct. 8	Mar. 17	Mount Carmel	Sept. 30	June 4
Riddleton	Oct. 8	Apr. 11	Mount Pleasant	Sept. 5	June 14
Texas:			Nephi	Sept. 15	June 5
Abilene	Nov. 12	Mar. 14	Richfield	Sept. 15	June 3
Austin	Nov. 29	Mar. 3	St. George	Nov. 6	....
Benjamin	Nov. 2	....	Salt Lake City	Oct. 29	Apr. 22
Brady	Nov. 1	....	Snowville	....	June 4
Brazoria	Nov. 18	Mar. 3	Taylor's Ranch	Sept. 25	June 6
Brenham	....	Mar. 2	Vermont:		
Brownsville	(²)	Mar. 1	Brattleboro	Sept. 23	May 12
Brownwood	Nov. 3	Mar. 16	Burlington	Oct. 21	....
Caddo Peak	....	Mar. 16	East Berkshire	Sept. 29	June 3
Childress	....	Mar. 16	Hartland	Oct. 3	May 12
Cleburne	Oct. 27	....	Lunenburgh	Sept. 29	May 1
College Station	....	Mar. 2	Manchester	Oct. 17	....
Colorado	Nov. 2	Apr. 1	Northfield	Sept. 29	May 17
Columbia	....	Mar. 2	St. Johnsbury	Sept. 21	....
Corpus Christi	(²)	Mar. 1	Strafford	Oct. 21	May 9
Dallas	....	Mar. 17	Virginia:		
Decatur	Nov. 9	Mar. 16	Alexandria	....	Apr. 20
Duval	Nov. 29	Mar. 2	Bird's Nest	Nov. 16	Apr. 2
El Paso	Nov. 1	Mar. 15	Bolar	Sept. 22	Apr. 29
Epworth	Nov. 5	Apr. 1	Cape Henry	Nov. 29	Mar. 17
Forestburgh	Nov. 28	Mar. 16	Christiansburgh	Oct. 5	Apr. 14
Fort Elliott	Nov. 2	Apr. 2	Dale Enterprise	Oct. 9	Apr. 20
Fort Worth	Nov. 28	....	Fall Creek	....	Apr. 21
Fredericksburgh	Nov. 17	Mar. 2	Lexington	Sept. 22	Apr. 22
Gainesville	....	Mar. 16	Liberty	Nov. 16	Apr. 1

² No frost prior to January 1, 1890.

DATES OF THE FIRST AND LAST KILLING FROST FOR THE SEASON 1889–'90—Cont'd.

States and stations.	First.	Last.
Virginia—Cont'd.		
Lynchburgh	Oct. 9	Apr. 2
Marion		Apr. 21
Middletown	Nov. 7	
Mossingford	Nov. 29	Apr. 20
Norfolk	Nov. 7	Mar. 17
Nottoway C. H	Oct 9	Apr. 21
Petersburgh	Nov 16	Apr. 20
Richmond	Nov 16	Apr. 20
Salem		Apr. 20
Smithfield	Nov. 25	Apr. 6
Spottsville	Oct. 9	Apr. 21
Staunton		Apr. 21
Summit	Oct. 9	Apr. 21
Washington:		
Blakely	Nov. 15	Apr. 19
Doe Bay		Apr. 12
Fort Canby	Nov. 22	Feb. 28
Neah Bay	Dec. 13	Apr. 15
Olympia	Sept. 11	Apr. 15
Port Angeles	Sept. 12	Apr. 24
Pysht	Nov. 4	(1)
Spokane Falls	Sept. 11	Apr. 15
Tatoosh Island	Dec. 23	May 29
Vashon	Dec. 11	
Walla Walla	Nov. 1	Apr. 13
Waterville		Apr. 15
West Virginia:		
Clarksburgh	Sept. 22	
Ella	Oct. 8	Apr. 19
Kingwood	Oct. 22	May 12
Mount Alto		May 11
Oceana		Apr. 20
Parkersburgh	Oct. 7	Apr. 11
Pleasant Hill	Sept. 23	Apr. 22
Rowlesburgh	Oct. 23	
Seven Pines	Oct. 9	May 8
Tannery	Oct. 8	May 12
Tyler Creek	Oct. 22	Apr. 1
Wisconsin:		
Butternut		May 17
Wisconsin—Cont'd.		
Cadiz	Sept. 27	May 15
Embarrass	Sept. 19	May 16
Fond du Lac	Sept. 27	May 17
Friendship	Sept. 27	
Glasgow		May 7
Grantsburgh	Sept. 18	May 27
Green Bay	Aug. 7	May 11
Greenwood	Aug. 5	May 27
Hayward	Oct. 14	
Honey Creek	Oct. 7	May 6
Horicon		May 5
La Crosse	Sept. 21	May 7
Lincoln		May 4
Madison	Oct. 6	May 5
Manitowoc	Sept. 27	May 17
Milwaukee	Sept. 27	May 6
Neillsville	Sept. 18	May 27
Oshkosh		May 29
Potosi		May 17
Richland Centre	Oct. 4	
Summit Lake	Sept. 20	May 16
Viroqua	Sept. 27	
Wauconsta	Sept. 19	May 20
Wausau	Sept. 19	
Wauzeka	Sept. 18	May 6
Weston		May 17
Wyoming:		
Carbon	Oct. 3	
Cheyenne	Sept. 5	June 17
Evanston	Oct. 4	
Fort Fetterman		June 6
Fort McKinney	Sept. 4	June 5
Fort Washakie	Sept. 4	June 16
Lander		Apr. 20
Lusk	Sept. 10	
Owen		June 14
Saratoga	Oct. 10	Apr. 25
Wheatland		June 5

[1] Station closed before last frost was to be expected.

APPENDIX 17.

DATES OF CLOSING AND OPENING OF NAVIGATION ON THE LAKES AND RIVERS AT SELECTED STATIONS OF THE SIGNAL SERVICE FOR THE WINTER OF 1889–'90.

Stations.	Lakes or rivers.	Navigation. Closing.	Navigation. Opening.
Illinois:			
Cairo	Mississippi River	(1)	(1)
Chicago	Lake Michigan	Dec. 15	Apr. 8
Iowa:			
Davenport	Mississippi River	Jan. 15[2]	Mar. 22
Dubuque	....do	Nov. 29	Apr. 1
Keokuk	....do	Nov. 28	Mar. 18
Kansas:			
Leavenworth	Missouri River	(1)	(1)
Kentucky:			
Louisville	Ohio River	(1)	(1)
Maryland:			
Baltimore	Patapsco River	(1)	(1)
Michigan:			
Alpena	Lake Huron	Jan. 16[2]	Mar. 31
Detroit	Detroit River	Dec. 1	Mar. 3
Mackinaw City	Mackinaw Straits	Jan. 4	Apr. 9
Marquette	Lake Superior	Nov. 30	Apr. 23
Port Huron	Lake Huron	Dec. 11	Mar. 30
Sault de Ste. Marie	St. Marie's Canal	Dec. 4	Apr. 20
Minnesota:			
Duluth	Lake Superior	Dec. 4	Apr. 21
Moorhead	Red River	(3)	(3)
St. Paul	Mississippi River	Sept. 26	Apr. 24
Missouri:			
St. Louis	Mississippi River	(1)	(1)
Montana:			
Fort Custer	Big Horn River	Nov. 17	Mar. 7
Nebraska:			
Omaha	Missouri River	Nov. 28	Mar. 19
New York:			
Albany	Hudson River	(1)	(1)
Buffalo	Lake Erie	Dec. 14	Mar. 31
Oswego	Lake Ontario	(1)	(1)
North Dakota:			
Bismarck	Missouri River	Nov. 13	Apr. 4
Ohio:			
Cincinnati	Ohio River	(1)	(1)
Cleveland	Lake Erie	(1)	(1)
Sandusky	....do	Dec. 6	Mar. 17
Toledo	....do	Dec. 7	Mar. 24
Pennsylvania:			
Erie	Lake Erie	(1)	(1)
Pittsburgh	Ohio River	(1)	(1)
South Dakota:			
Fort Sully	Missouri River	Nov. 25	Apr. 6
Tennessee:			
Chattanooga	Tennessee River	(1)	(1)
Nashville	Cumberland River	(1)	(1)
Wisconsin:			
La Crosse	Mississippi River	Nov. 29	Mar. 20
Milwaukee	Lake Michigan	(1)	(1)

[1] Navigation not interrupted. [2] 1890.
[3] No navigation for last two years on account low water. 2824 Obs., 90.

APPENDIX 18.

REPORT OF ASSISTANT PROFESSOR IN CHARGE OF THE INSTRUMENT DIVISION.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington, D. C., July 7, 1890.

SIR: I have the honor to submit the following report of the work of the Instrument Division for the fiscal year ending June 30, 1890.

Beginning with July 1, 1889, the machine shop has formed a part of this division; being previously under the immediate control of the Disbursing Officer. This has greatly facilitated and expedited the work of repair and modification of instruments, and offers many advantages over the previous arrangement.

The work with which this division is now charged may be classed under the following items:

[(1) Supervision of station instruments and their exposure.

(2) Maintaining in stock the necessary supply of all kinds of meteorological instruments used at stations. The packing and shipping of these, except the heavier kinds, as may be required.

(3) Repairing and reconstructing instruments and such general repairs about the office as may be done by the machinists.

(4) Repairing, refilling, and standardizing barometers.

(5) Determination of corrections for instrumental errors of all new and rescaled thermometers, and preparation of correction cards therefor.

(6) Custody and care of standards and substandards and various apparatus for special experimental work. Also the maintenance in operation of a number of self-registering meteorological instruments.]

(7) Original experimental work and study.

The personnel of the division during the first months of the year consisted of three clerks and three machinists. A greatly needed increase in this force was made February 24, 1890, by the assignment of an additional assistant to aid in packing and preparing instruments for shipment.

An additional clerk, temporarily detailed, has also aided in special work and the reduction of observation upon anemometry, vapor pressures, and other experimental studies.

On May 16, 1890, the death of Mr. Adolph Eccard made vacant the position of chief machinist. Mr. Eccard's long connection with the various instruments and accessories used at stations, together with his natural ingenuity and diversity of information respecting mechanical and electrical questions, rendered him very useful and his services in demand in many different ways. Among the self-registering instruments in operation in the instrument room some have been designed by him and others have been improved or modified in important particulars and have long been in successful operation. The vacancy has been filled in a very satisfactory manner by the promotion of Mr. C. B. Tuch, a skilled mechanician, heretofore having charge of the self-registering instruments and preparation of barometers.

The large amount of time consumed in completing contracts for instrument cases and furniture for the instrument room greatly delays the work of setting up and putting in working order the self-registering instruments maintained at this office. The instrument room is now, however, practically restored, and, while not being highly elaborate nor ornamental, is believed to be quite complete and as creditable in every respect as circumstances admit.

SUPERVISION OF STATION INSTRUMENTS.

Every effort has been made to improve and complete the equipment of instruments at stations and bring about as great a degree of uniformity in exposures as possible.

The introduction of self-registering instruments has still been pursued, and, during a greater or less part of the past year, a number of stations have secured continuous records of all, or nearly all, the more important meteorological elements. Recently 25 of these stations have been specially announced as stations of the first order, taking continuous observations.

A complete equipment of instruments at stations comprehends, as far as possible, a duplicate set at each, but this principle can not be fully carried out in all cases.

The table below shows the number and kind of instruments in use at stations of the first and second order:

At second order stations:

Anemometers	2
Barometers, mercurial	2
Rain-gauge	1
Snow-gauge	1
Anemometer register	1
Instrument shelter	1
Anemometer support	1
Wind-vane support	1
Whirling apparatus	1
Wind vanes	2
Thermometers, dry bulb	2
Thermometers, wet bulb	2
Thermometers, maximum	2
Thermometers, minimum	2
Supports for rain and snow gauges.	

Additional instruments at first order stations.

Barograph	1
Register; recording rainfall, wind velocity, and wind direction	1
Electrical recording attachment to wind vane	1
Sunshine recorder	1
Thermograph	1

While thus far only 25 stations are regularly rated as first-order stations, yet between 25 and 30 additional stations have been using thermographs for the greater part of the year. Observations of evaporation have also been carried on at some 20 selected stations.

The standard pattern of instrument shelter, recommended some years since by Professor Hazen, is still in use for the exposure of thermometers and temperature instruments.

For satisfactory exposures of anemometers and wind vanes it is necessary they be raised from 15 to 25 feet above the roofs of the offices, and for this a great variety of supports have been used in the past, especially for the anemometer, the dial of which previous to the past year was read once in every 24 hours, requiring that the instrument could be conveniently lowered to some accessible point. Early in this year the electrically recording mechanisms of the anemometer were improved in such a manner that weekly instead of daily readings furnished all the check necessary upon the automatic record. The use of a much simpler support thereby became feasible, and, after a very satisfactory trial at this office, a simple combined support for both wind vane and anemometer has been furnished certain stations where new supports were needed.

This support consists of 1½ and 2 inch wrought iron pipe. The lower end being secured to the roof, three adjustable guy rods attached near the top, give the desired rigidity to the support. The wind vane, mounted on rolling bearings, is placed at the top, with the rod which operates the electrical contacts for self-recording vanes passing downward on the inside. At a distance of from 2 to 3 feet below the wind vane the support carries a horizontal arm, about 3 feet long, the anemometer being placed on the outer end of this. Several iron steps clamped about the main pipe form a ladder that affords a sufficiently convenient access to the anemometer dial.

These modifications greatly lessen expenses of transportation and the erection and setting up of the instruments, so that the advantages of the improvements are greater than at first appear.

With a view to the better furnishing of stations, and especially to the better preservation of the mercurial barometers used, a suitable and nicely made barometer box has been sent to some 60 stations. The box is large enough to contain both the station and extra barometers, and is provided with glass panels at the front and side to afford the best possible illumination. The barometers are suspended freely from specially constructed supports of such nature that the barometer can be held rigidly while adjusting for readings but without in the least interfering with the verticality, which is determined by the free suspension of the barometer itself. It is believed that with these boxes observers should have no difficulty, generally, in preserving their barometers in good order for a much longer time than heretofore.

During the year 30 of the old barometers of the service were fitted with the improved cistern, designed some years since by Mr. Tuch of this division. These are now being regularly supplied to stations when replacing unserviceable barometers.

This cistern is made of iron, with the usual glass portion at the top. The adjustment of the mercury to the ivory point is effected by means of a neatly constructed piston provided with a screw motion. They have given very general satisfaction, and prove more durable than the leather bag of the old Fortin construction.

Many items of repair and slight alterations in locations and exposure of instruments, as also the more secure packing of instruments for shipment, render it advisable that observers be provided with a few tools for doing such work. This need has been partially met by the purchase of small tool chests, made after our own design, and fitted with the ordinary mechanics' tools. Twenty-five sets have been distributed to the larger stations.

The introduction of self-registering instruments has considerably increased the number of batteries needed at stations, and, with a view of providing better facilities in this connection and also improving the furniture of the offices, designs were drawn up during the year of a compact and portable form of battery stand of sufficient capacity to answer the needs of first-order stations. These were so arranged as to be inclosed, if desired, within a nicely finished stand or table, upon which can be placed the triple registers and other self-registering instruments, especially those recording electrically. Suitable drawers provide room for record sheets, pens, ink, and other accessories used with the instruments; the whole being well finished and in every way ornamental as a piece of office furniture. The contract for furnishing these has not been fulfilled thus far, so that none are in use as yet.

The coöperation between the Cuban and the United States Meteorological Services rendered the intercomparison of barometers important, and through the courtesy of Prof. Luis G. Carbonelly and Dr. Vines, of Havana, comparisons were made with the standards of both the Naval Observatory of Cuba and that of the Royal College of Belen. The actual comparisons were intrusted to Sergeant H. B. Boyer, the observer in charge of the station at Key West, Fla., and were executed by him in a very creditable and satisfactory manner, under the special instructions from this office. A new barometer was very carefully fitted up at this office and sent to Key West in the usual manner, by mail. It was then carried to Havana by Sergeant Boyer and carefully compared, on November 6 to 9, 1889, with both the Naval Observatory standard and also that of the Royal College of Belen. The two Cuban barometers, as determined by comparison with the Signal Service barometer, agree almost exactly, the difference being too small to notice. The Signal Service barometer, however, seems to read a trifle higher than the Cuban standards, the difference is considered to be 0.006 inch.

The correspondence growing out of the supervision of station instruments and exposures, as also the other items of work, is now prepared, copied, and mailed by this division. The copying and mailing, together with all indexing and similar work incidental to this correspondence was, previous to August 12, 1889, done by the correspondence division. During the year, 1820 letters were sent out, including 809 circular letters.

PURCHASE AND ISSUE OF INSTRUMENTS.

With very few exceptions all instruments and supplies are purchased in the usual manner by contract with the lowest bidder. As is well known to those familiar with the operation of this system, it presents serious difficulties in certain cases and frequently leads to unsatisfactory results, especially in the construction of new and complicated instruments and the purchase of special supplies, in which excellence of quality are of the first importance.

Full and complete specifications and drawings originate with this division, and represent a large amount of work and study.

It is believed the shipment from this office of the large number of instruments of a fragile character is attended with, in general, the most satisfactory results in respect to breakage and damage in transportation. The loss from this cause is only a very small one, and every effort has been exerted to keep it at a minimum. With the exception of the largest and heaviest instruments, shipments are, in general, made either by registered mail or through the agency of the Railway Mail Service. This latter is considered as affording the most secure and safe transmission. Formerly it was rarely used except in sending instruments out from this office. Within the year arrangements have been made by which instruments returned from stations may also be shipped in this way. The large and increasing number of voluntary observers receiving supplies indirectly from this office through the observers in charge of State centers, makes this arrangement of special value, and the service is greatly indebted to the Post-Office authorities, and the Superintendent of the Railway Mail Service in particular, whose personal efforts have been directed towards insuring as great safety as possible in the transmission of our instruments, and who has kindly aided in the extension of the facilities heretofore enjoyed.

The proper and best method of packing our instruments has also been specially considered during the year, and this branch of the work is believed to be in a state of great perfection.

The table below indicates the number of more important instruments sent to, and returned from, stations:

	Issued.	Returned.
Anemometers	97	104
Barometers	88	87
Barographs	34	11
Sunshine recorders	20	0
Anemometer registers	53	48
Triple registers	15	0
Thermographs	24	15
Telethermographs	6	3
Thermometers (all kinds)	1,021	443

In many cases the instruments returned to this office are defective, or otherwise unserviceable, and are frequently repaired and put in stock for issue. In the case of thermometers, however, only good ones are returned to this office; all broken or unserviceable instruments being held at stations to be condemned and destroyed by inspectors.

WORK IN MACHINE SHOP.

This work is of the greatest variety, being largely in the way of repair of anemometers, anemometer registers, thermographs, barographs, the metal parts of barometers, military signaling apparatus, telephones, telegraph instruments, typewriters, etc., Whenever practicable, repair work is done outside, by contract, but in general better results are secured by doing it at this office.

All anemometer and wind-vane supports furnished stations are fitted up by the machinists to suit the various requirements, and are then turned over to the storekeeper, complete for shipment.

In addition, a small amount of new work is done from time to time consisting of the construction of apparatus and devices used in testing other instruments and experimental study or the development of improvements in instruments.

Such repairs as are readily classified are shown in the following table, and constitute an important part of the work done:

Instruments.	Number Repaired.	Instruments.	Number Repaired.
Anemometers	99	Self-recording rain gauges, adjusted	22
Barometers	22	Air-pump	1
Thermographs	12		
Anemometer registers	45		

Among the special instruments and devices made may be mentioned a quadruplex register, used in the comparison of anemometers in the open air; the records of four anemometers being made side by side on the same sheet of paper. Also a device for measuring vapor pressures, used during the winter by Professor Hazen. Apparatus and lamps used in glass blowing were also made.

PREPARATION OF BAROMETERS.

The Service having on hand an excess of the metallic parts of barometers, new instruments have not been purchased for some years past. New tubes are filled and fitted to the old cases wherever necessary, using the new style cistern already referred to. These barometers are then carefully compared with standards, the scales adjusted as nearly correct as possible, and finally the corrections for instrumental error accurately determined. No pains are spared in this work, and it is confidently believed that the quality of barometers in use is not only of great uniformity but of an excellence not generally attained by many manufacturers.

An important consideration in connection with the accuracy of barometers of the size now used, is the question of uniform capillary action. The methods of comparison with standards at this office eliminates almost entirely these errors in the case of instruments used at stations not differing much in elevation from Washington. To secure the same accuracy for high level stations, artificial conditions of low pressure are necessary, and facilities for accurate work in this connection are not at hand. The question has engaged my attention, however, but being closely occupied with other important work, only a few preliminary steps have thus far been taken in this matter.

COMPARISON OF THERMOMETERS.

The rigid system of comparison to which all thermometers now used by the Service are subjected, not only determines such errors in graduations as are unavoidably introduced, but in connection with corresponding requirements of contractors in the purchase of new instruments, has had a very beneficial influence upon manufacturers of the highest grade thermometers. The skill displayed in producing large numbers of instruments whose errors of graduation rarely exceed one or two-tenths of a degree, is quite remarkable, considering the difficulties in the way.

During the year about 1,600 thermometers were compared as follows: At intervals of 10°, about 1,000 minimum and mercurial thermometers (from —20° to + 110°), and about 325 maximum thermometers (from 32° to 110°); also some 275 old, miscellaneous thermometers at 32°. When the corrections, at 32°, for these old thermometers were found to have changed, corresponding new corrections were computed from previous comparisons for other points of the scale.

The comparison of maximum thermometers at temperatures below what may happen to be the air temperature at the time of comparison, is attended with the difficulty of forcing the mercurial column into the bulb through the constriction in the tube. For a single thermometer the matter is very simple; for one or two hundred it is much less so. An excellent device for facilitating this work was designed and purchased last year; its use has realized every expectation. The thermometers, in bunches of 12, are attached to metal plates, which are placed one at a time in a metal box or receptacle, of such form as to admit of packing the bulbs and a portion of the stems of the thermometers in chipped ice. Two of these receptacles, containing together 24 thermometers, are placed respectively upon the two extremities of a horizontal arm supported upon a vertical axis at its center. A handle and gearing enable one to whirl the thermometers while thus packed in ice until all are "set," that is, until the mercury in the stem has united with that in the bulb. The receptacles can then be removed and the readings of the thermometers taken, thus furnishing the correction at the freezing point. After this the thermometers are kept in cold water until the comparisons have been carried above the air temperature.

For the comparison of thermometers for northern and cold stations, especially minimum thermometers, considerable difficulty is experienced in artificially producing temperatures lower than —20° F. The evaporation of liquid anhydrous ammonia is capable of producing such a temperature in a most satisfactory manner, and liquid nitrous oxide can be used for temperatures of nearly 90° below zero. The use of this latter, however, has proved to be exceedingly troublesome and very uncertain. The liquid is ordinarily under a pressure of several hundred pounds per square inch, and its liberation in such a manner as to utilize the latent heat of evaporation presents many difficulties, and is attended with the greatest uncertainty and some little danger. The temperature realized is quite beyond control, sometimes not changing at all, and again frequently falling far below that desired. These irregularities are a direct consequence of the attempt to evaporate the extremely volatile liquid in the open air, with the further objection that the more or less valuable chemical passes entirely beyond recovery, and must be constantly purchased anew.

The utilization of the latent heat of evaporation for the artificial production of very low temperatures can be realized in the most elegant and economical manner by the use of a system of pumps and condensers, that operate to evaporate and recondense the volatile liquid employed. Except slight losses from leakage, etc., nothing is wasted in this process, and the low temperature is simply a question of the expenditure, in accordance with beautiful thermodynamic principles, of a certain number of foot-pounds of mechanical energy, a quantity subject to control to any desired degree of nicety.

Such a process, carried out in a very elaborate manner, has been used by M. Pictet in his famous experiments of the liquefaction of oxygen. A rough outline of a similar apparatus, suited to the needs of the Service, was prepared during the winter and submitted to the manufacturers of M. Pictet's appliances, with a view of ascertaining the feasibility of the scheme, its probable cost, and the amount of power required to operate the pumps. It is found that the present arrangement of rooms and the space available about the Instrument Division does not afford a suitable place for such apparatus, which should be permanently set up in a room by itself, and arranged to be operated by an electric motor of 2 or 3 horse-power. The probable cost of the whole appliance would amount to less than $1,500, and once set up and put in successful operation, would render the now troublesome comparison of thermometers at all temperatures below freezing a very simple and easy operation.

CARE OF STANDARD AND OTHER INSTRUMENTS.

With the new instrument cases and other pieces of office furniture received during the year have come improved facilities for the care of the supply of valuable testing instruments and the standards of the Service.

The special self-registering meteorological instruments have been put in thorough repair, and defects in the mechanisms remedied before setting up.

Attention has been given to increasing the accuracy of the records from self-registering instruments. Sufficient attention has not been given heretofore to the correctness of the rulings of the various printed forms used. The time intervals, as also the spaces representing the phenomena recorded, have been found noticeably irregular and at fault. In some measure this has been due to original bad ruling, but it is also attributable to the manipulation of the paper while being printed. These evils have been completely remedied by procuring new engravings on stone and exercising certain precautions during the subsequent operations of printing. The engravings were made under personal supervision, and in a manner that secured practically perfect equality and accuracy of spacings. The next important consideration has been to produce exact printed copies of the original engraving. The greatest error has heretofore been introduced in making the "transfer" from the engraving to the stone finally used. The necessities of the case being presented to the lithographer, he was at once able to make the most perfect transfers. With the exercise, while printing, of proper care in respect to what printers term "register," large numbers of the forms in printed sheets can be struck off, and afterwards stacked up and at once trimmed with great precision to accurately fit the various registering instruments, thus avoiding the necessity of trimming each sheet separately by hand, as has been generally done.

Some instruments still need new engravings that it is contemplated to procure after the present supply of forms is exhausted.

EXPERIMENTAL STUDIES.

The work which has been discussed above may be considered as constituting the essential and characteristic work of the Instrument Division, and its supervision. This, if it receives the attention it needs, not only occupies the time during the day of the one in charge, but the development and improvement of instruments and methods forms an additional subject that requires and receives a large amount of study and consideration. The official in charge, therefore, in attempting to carry on any work of original experimental investigation, except of the most trivial and ordinary character, is at once embarrassed and discouraged by the serious interference of the two classes of work and the necessity of laying aside or neglecting, in greater or less degree, many important considerations. As the advancement of meteorology as a science depends in a large measure upon the progress of experimental research and investigation, this latter merits every encouragement that can be given it. Under the circumstances very satisfactory progress has been made in certain lines of experimental work taken up during the past year, and others have been studied only in a limited degree. Among the latter may be mentioned the phenomenon of the pulsatory or harmonic motion of the mercurial columns of ordinary thermometers, subject to the influence of steadily changing temperatures. The question has received considerable attention of late and has an important bearing upon accurate temperature observations and the comparison of thermometers. In this respect, however, the investigations, made under conditions similar to those of the comparison of thermometers, indicated in a conclusive manner that the magnitude of the pulsations, if they existed at all, was quite inappreciable; that is, less than 0.05° F. The considerable time required made it impossible to extend the experiments to other conditions that, it is represented, are more favorable to the development of the phenomena.

An effort was also made to take up a study of the accuracy and reliability of the bimetallic thermometers now being used somewhat extensively. The method employed is considered a very beautiful one, in that the magnification of the motion of the bimetallic system is effected by the use of mirrors and completely eliminates any question of friction of mechanical mechanisms. The results obtained were fairly favorable, though the examination extended over too short a time to warrant definite conclusions.

The more important experimental studies were in connection with the questions of the accurate measurement of wind velocities, the measurement of wind pressures at high velocities, and the determination of the moisture contents of the air at low temperatures.

A discussion of anemometer and wind-pressure experiments is given in Appendix 25.

HUMIDITY MEASUREMENTS.

The last question mentioned above, viz, the accurate measurement of the moisture contents of the air at low temperatures, requires two separate and independent investigations; first, the measurement of the maximum pressure of aqueous vapor at all low temperatures, and, second, the determination of the psychrometer constants at low temperatures.

As the latter investigation could only be carried on in a locality the air temperature of which is particularly low, arrangements were made for conducting the experiments in northwestern Minnesota. Professor Hazen undertook this difficult task, and advantage was taken of the opportunity to also make observations upon the vapor pressure, a portable apparatus being devised for this purpose. The results of Professor Hazen's experiments are given in his own report, which follows below.

Before describing what has been done at this office in the study of the maximum pressures of aqueous vapor it is desired to refer briefly to the values heretofore used. The results of the elaborate and skillfully conducted series of experiments of M. Regnault at once took precedence of all other determinations and are at present the almost universally recognized values. Some errors in the tabulation of his experiments were made by M. Regnault and were afterwards pointed out and corrected by Moritz. These values were again corrected in order to reduce Regnault's temperatures to the normal temperatures of the International Bureau of Weights and Measures, and to reduce the mercurial pressures to normal pressures under standard gravity at sea level. This correction and recomputation of tables by a new formula was made by Dr. O. J. Broch. (See Travaux et Mémoires du Bureau International des Poids et Mesures, Tome I.)

The humidity tables used by the Signal Service since 1886 have been based upon Broch's values. The lowest temperatures observed by Regnault were about −22° F., and the extension of the tables considerably below this point, as is required by the meteorological conditions of the Northwestern and other portions of this country, leads to great uncertainties. This uncertainty becomes still greater when it is noticed how very poorly Broch's tabular values agree with Regnault's observations at temperatures below 0° C. The tabular values are almost without exception 10 per cent. or more higher than the observations. In undertaking the direct observation of the vapor pressure at low temperatures it was intended simply to extend Regnault's work. Experience has shown, however, that it is impossible thus far to obtain the same values as Regnault at temperatures either above or below freezing. With the exception of the results obtained by Professor Hazen, the observations at the temperature of melting ice have agreed exactly with those of Regnault. At lower temperatures the values are uniformly lower than Regnault. Before any explanation is offered for this it will be necessary to describe somewhat the methods used. Regnault's apparatus and methods are very fully described in the account of his experiments, from which it seems that while his observations above 32° were made with several different kinds of apparatus, yet those below the freezing point depend entirely upon one instrument, and, so far as can be learned, the three series of experiments were simply repetitions of observations with exactly the same apparatus. This consisted of two barometer tubes, 14 millimeters inside diameter, attached side by side to a suitable support and dipping into the same cup of mercury. One of the tubes was filled in the very best possible manner as a barometer, and was frequently compared with a standard. The other tube was connected at the top by a horizontal tube, the outer portion of which was bent downward and carried at the extremity a large bulb of about 500 cubic centimeters capacity. This bulb could be surrounded by a bath of chloride of calcium and chipped ice, or other freezing mixture, for producing the desired low temperatures. The horizontal tube, between the bulb and the barometer tube, was provided with an outlet to which an air pump was attached. After drying the apparatus the best possible vacuum was produced and the air pump cut off by fusing the glass tube just at the outlet. There was previously introduced into the large bulb a small sealed glass capsule, so nearly full of thoroughly boiled pure water that the application of a slight amount of heat would cause the expansion of the water and the fracture of the capsule, thus filling the apparatus with vapor and providing a small excess of water.

The air pump used was imperfect, and a small quantity of air was always left in the bulb and tube. This was carefully measured before breaking the capsule of water by packing the bulb and stem in ice and noting the difference in the heights of the mercury columns. The amount of this air is not definitely stated, but is given generally as about 1 millimetre. A computation of the pressure exerted by this air at different temperatures of the bulb is afterwards made and applied to the corresponding observations; the result, after correcting for the temperature of the mercury, being the pressure of the aqueous vapor. Uncertainties in the value of this correction for vacuum, amounting to at least several hundredths of a millimetre are quite probable, and would seriously affect the results at low temperatures. Again, the two mercurial columns are so long that differences of a few tenths of a degree in their mean temperatures would easily lead to errors of nearly a tenth of a millimetre in the vapor pressure. Modern appliances make it possible to produce a very much more perfect vacuum than that obtained by Regnault, and a few important modifications of his apparatus eliminates various small errors that are of the greatest importance at the lowest temperatures. The apparatus devised for the purpose of the present investigation has been prepared with several modifications, but its essential and peculiar feature consists in joining the two barometer tubes so as to form a U tube instead of dipping the two lower open ends in a cup of mercury, itself open to the air. With this arrangement not only the effects of the atmospheric pressure are perfectly eliminated, but the mercurial columns need not be more than 6 or 7 centimetres long, and the liability of error due to unequal temperatures of the mercury in the two arms lessened tenfold or more. Again, the device is compact, and, in addition to being portable, is, with reasonable care, perfectly permanent in its character and can be used at any time. One branch of the U, it is understood, is extended horizontally at the top and again bent downward with a bulb at the end for containing the necessary amount of water. In the instrument used by Professor Hazen the bulb was about 4 centimetres in diameter and was joined to the top of the U by only a short neck, the internal diameter of the branches of the U being between 13 and 14 millimetres. The metallic framework supporting the tube was fitted with two sliding collars that could be adjusted to the tops of the mercurial columns, exactly the same as in ordinary mercurial barometers of good construction. A finely-engraved millimetre scale was connected with the collar encircling the "wet" branch of the U (as the tube with the bulb attached and containing the vapor will be termed); similarly the collar around the "dry" branch had joined, and moving with it the vernier to match the above scale. The smallest count of the vernier was 0.02 millimetre, and the engraving of the scale was sufficiently well done to admit of the subdivision of this so far as to read 0.005 millimetres if necessary.

The filling of this apparatus, which was the first one made up, as, in fact the construction of several others afterwards, proved more difficult than was at first imagined, owing, principally to inexperience in the peculiar work and especially to the lack of necessary skill in glass-blowing, no assistance whatever of this kind being available. Moreover, the only air pump available at first was a very ordinary barrel pump incapable of producing a vacuum of much less than a centimetre. In order to perfectly exhaust the tube with such appliances, the mercury to be retained in the tube was made to aid in completing the vacuum. The bulb terminated in a fine capillary tube; the other extremity of the apparatus was connected through a capillary tube to a bulb of about twice the capacity of the first bulb and thence to the pump. After carefully drying, every part of the apparatus was filled with pure mercury drawn in through the bulb end and in such a manner as to exclude all the air. Owing to the several bends it was necessary to turn the tube into different positions as the mercury advanced. When entirely filled with mercury including more or less of the capillary tube on the side next the pump, a small quantity of thoroughly boiled, distilled water was drawn in after the mercury. The capillary tube from the bulb was then fused without admitting air. The whole device at this stage is filled with mercury and water. By placing the tube in the proper position and producing a vacuum in front of it, the mercury, or as much of it as may be desired, can be drawn off, leaving, except the vapor of water a perfect vacuum behind it. At the proper time the capillary tube next the pump is fused and the apparatus is practically complete. This simple statement gives a very poor idea of the many details and the extreme care required to successfully complete the process. Moreover, subsequent examination showed that the vacuum produced was not as good as it seemed reasonable to expect. In using the apparatus the central stem was held by supports at the top and bottom in such a manner as to be capable of rotation about a fixed axis, which could be brought into a strictly vertical position by adjusting screws. Thus arranged the errors of verticality are very small, and almost entirely, if not perfectly, eliminated by taking the mean of two readings with the U-tubes in positions 180° different.

Some of the discrepancies in the results obtained by Professor Hazen may possibly be traced to imperfections in respect to the vacuum. Much better results were afterwards secured by the use of a specially constructed Sprengel pump. All joints and connections of the apparatus must be by the fusion of glass tube, and many delays and failures have arisen from need of greater skill in glass work. When using the Sprengel pump the water is first inclosed in a sealed tube, and this, of course, must be perfectly free of air. As the experiments progressed many difficulties and sources of error were discovered and required considerable study and investigation. The most satisfactory results in respect to the proper methods of constructing and preparing such apparatus have been developed and perfected.

As stated above, the pressures thus far observed are noticeably different from those of Regnault, except at the freezing point, where the agreement may be said to be perfect. If this difference is confirmed by observations yet to be made it is probable the whole table of vapor pressures will require modification.

As soon as opportunity permits, it is contemplated to set up an apparatus exactly like that used by Regnault, and reproduce, as nearly as possible, his conditions, and determine what differences, if any, may be due to different methods.

The U-tube device is also capable of a further important modification, by which the *differences* of the vapor pressures at two different temperatures are measured. For this both branches of the U are connected with bulbs. In filling the apparatus the water is first admitted to one bulb only. After complete observations have been made under this condition, the apparatus is laid on its side so that the two bulbs are in free communication, and a portion of the water distilled from one to the other. When erect and at the same temperature the mercury columns should be level. One bulb is then packed in chipped ice and the other bulb exposed to any temperature it may be desired to observe, the result being the difference in the pressures for the two temperatures. The bulbs can also be interchanged. It is believed results of the greatest value are to be derived in this way. One tube constructed for such experiments accidentally broke after observations in the first condition were made.

It has been impossible to more than outline here the large amount of work that has been done in this connection. Many highly interesting and important details, as also a considerable number of observations, are reserved for a subsequent report. It is believed that the many difficulties experienced at first in the preparation of the tubes, of the great perfection required, and the delays incident to the arrangement in the most appropriate manner of the various accessories employed, have all been successfully disposed of. The sources of error being also traced out and eliminated or made subject to determination, the remainder of the work will be confined principally to observations, one or two more tubes of the latest pattern only being needed.

EXPERIMENTS IN MINNESOTA BY ASST. PROF. H. A. HAZEN.

For the purpose of extending Regnault's vapor pressures to temperatures below —22° F., and determining, if possible, the relation between the sling psychrometer and Regnault's condensing hygrometer for temperatures below 32° F., three months (January, February, and March, 1890) were spent in Minnesota. By the courtesy of Carleton College, at Northfield, two rooms were set apart for carrying on this work in connection with the chemical laboratory. Every facility was extended by the college in these experiments, and this assistance deserves commendation. The month of March was spent in St. Vincent, where much lower temperatures were experienced; on four successive days the temperature reached —30° F.

VAPOR PRESSURE RESULTS.

The apparatus for these experiments was devised by Professor Marvin and has been described by him (see p. 657). In most respects it was admirably adapted for this work, and the method of observation was especially satisfactory although the constants of the apparatus have not been completely settled as yet. It was the intention to make the readings in the open air and without a bath, but a very short time sufficed to show that it would be practically impossible to obtain the temperature of the vapor in the large bulb by a thermometer placed against it on the outside, or even by having another bulb exactly like it containing a thermometer suspended close by. After a few trials a pocket or bag of "rubber dam" was fitted around the bulb, and in this a bath of water or a freezing mixture could be easily placed and manipulated by a rod or the hand on the outside. In some of the experiments undertaken to determine the effect of a slowly changing temperature upon the lagging of the bulb, the change was made either by manipulating with the warm hand for a rising temperature or with a test tube full of snow for a falling temperature. When the temperature was below freezing the "rubber dam" was cooled slowly by pouring a few drops of ether upon it.

After a few experiments at freezing it was found that this device was not entirely reliable, and a bath with two tin vessels was then arranged, and this gave perfect satisfaction. Most of the results finally adopted were obtained with this improved bath.

The following were some of the difficulties encountered and researches instituted in order to determine the errors and constants of this apparatus:

(1) The apparatus for hours at a time would take a "set," so to speak; that is, no possible changes that could be devised affected the result, which would sometimes have a constant difference of 0.06 or 0.07 millimetre from that previously determined.

(2) While the meniscus on the vacuum side kept well rounded under all conditions of rising or falling temperature, it was far otherwise on the moisture side. If the temperature were rising this meniscus became very much flattened and it was found practically impossible, by any rough usage, tapping, or shaking, within safe limits to prevent or remove this flattening. The method finally resorted to was to tip up the whole apparatus on the bulb side and then gently let it down; this would give a well rounded meniscus. This operation would generally make the vapor pressure about 0.03 millimetre greater than with a flat meniscus. In the final results this error has been corrected for as far as possible.

(3) It was found that the results at freezing were uniform and directly comparable at any given temperature of the apparatus, but when an attempt was made to compare observations with an outside temperature of 33° with others at 70° it appeared that the latter were invariably *lower*. Most careful observations were made with the bulb in melting snow and the outside temperature ranging from 33° to 112° with the following result.

Vapor pressure at 32° *m.m.*

[Outside temperature.]

32°	42°	52°	62°	72°	82°	92°	102°	112°
4.40	4.37	4.35	4.33	4.30	4.28	4.24	4.19	4.13

This was very unexpected and entirely contrary to what theory would indicate. The presence of air in the vacuum would account for a very small part of this but only a tithe of it. A series of experiments at temperatures below freezing showed that the same law was true with this apparatus, that is, the result with a temperature of apparatus above that of the bath was always lower than when the bath and apparatus were at the same temperature. In the final summing up and table of results the values have been reduced, as far as could be done satisfactorily, to the temperature of the bath. At the lowest temperatures which were 30° or 40° below the outside reading, there is probably a still outstanding correction, but it is exceedingly small not more than +0.01 or 0.02 millimetre. It is probable that there is a regular error, if any, in these results and, if three or four points on the curve can be found absolutely by other apparatus, a correction can be obtained which will make this table available throughout its extent.

(4) The lowest temperature was obtained by using snow and chloride of calcium, there being no difficulty in obtaining a result as low as −52° F., although with the chloride and snow used it was plainly manifest that the proportions given by most authorities allow too little snow, as it was found possible to lower the temperature several times to the lowest point by simply adding snow after the temperature had risen 20° to 30°.

(5) The simplest and easiest value to obtain was at 32°, and this was found to be 4.40 millimetres or .20 millimetre lower than the corresponding value by Regnault. This might be due to air or moisture or both on the vacuum side of the apparatus, although the amount seems excessive. It is evident that this is altogether too small an amount to satisfy and correct the discrepancies found under the third head above. If this is a veritable correction, due to air in the vacuum, there will be needed a correction of about +.17 millimetre at the lowest temperature in the table, −52°. It has been deemed advisable not to apply this correction, but to give the results as measured without it.

(6) Investigation was made to determine the effect of water on the mercury column in changing the reading, and it was found that the column was depressed .05 millimetre or a correction of +.05 was needed to the reading to allow for the presence of the water or for the capillary action of the water. It seems probable that the presence of the vapor on the bulb side would have an exceedingly slight effect on the reading, but this must be well-nigh inappreciable. If there is any effect of this kind, it might help in explaining the results under the third head.

(7) A series of experiments with slowly rising, stationary, and slowly falling temperature for the bulb gave too low a result by about .04 millimetre in the first case, but exactly the same with the two last methods. This was probably due to a faulty meniscus with slowly rising temperature.

The accompanying table gives a summary of all the observations with the vapor-pressure apparatus. It should be noted that these results are not to be regarded as absolute, but simply as showing the general trend of the curve, and requiring a slight modification at various points, owing to the fact that all the constants of the apparatus have not been determined. The column headed "Vapor pressure, Regnault," is made up from Regnault's original observations as published, and is not taken from the computed results.

Summary of Vapor Pressures Observed.

Temp. F.	Hazen.	Regnault.	Diff.	Temp. F.	Hazen.	Regnault.	Diff.	Temp. F.	Hazen.	Regnault.	Diff.
	mm.	mm.	mm.		mm.	mm.	mm.		mm.	mm.	mm.
—51	.07	......	......	— 1	.86	.96	.10	49	8.63	8.83	.20
—50	.07	......	......	0	.91	1.01	.10	50	8.95	9.16	.21
—49	.08	......	......	1	.96	1.06	.10	51	9.28	9.49	.21
—48	.08	......	......	2	1.01	1.12	.11	52	9.62	9.86	.24
—47	.08	......	......	3	1.06	1.18	.12	53	9.97	10.23	.26
—46	.09	......	......	4	1.12	1.24	.12	54	10.33	10.61	.28
—45	.09	......	......	5	1.18	1.32	.14	55	10.71	11.00	.29
—44	.09	......	......	6	1.24	1.40	.16	56	11.10	11.40	.30
—43	.10	......	......	7	1.30	1.48	.18	57	11.51	11.82	.31
—42	.10	......	......	8	1.37	1.56	.19	58	11.94	12.25	.31
—41	.11	......	......	9	1.44	1.64	.20	59	12.39	12.70	.31
—40	.11	......	......	10	1.52	1.72	.20	60	12.85	13.15	.30
—39	.11	......	......	11	1.60	1.80	.20	61	13.33	13.63	.30
—38	.12	......	......	12	1.69	1.89	.20	62	13.82	14.12	.30
—37	.13	......	......	13	1.78	1.98	.20	63	14.33	14.62	.29
—36	.14	......	......	14	1.88	2.08	.20	64	14.85	15.14	.29
—35	.15	......	......	15	1.98	2.18	.20	65	15.39	15.68	.29
—34	.16	......	......	16	2.09	2.29	.20	66	15.94	16.24	.30
—33	.17	......	......	17	2.20	2.40	.20	67	16.51	16.81	.30
—32	.18	......	......	18	2.31	2.52	.21	68	17.09	17.39	.30
—31	.19	......	......	19	2.43	2.65	.22	69	17.70	17.99	.29
—30	.20	......	......	20	2.55	2.78	.23	70	18.33	18.62	.29
—29	.22	......	......	21	2.68	2.91	.23	71	18.97	19.26	.29
—28	.23	......	......	22	2.81	3.04	.23	72	19.64	19.92	.28
—27	.25	......	......	23	2.95	3.17	.22	73	20.32	20.61	.29
—26	.26	......	......	24	3.09	3.31	.22	74	21.03	21.31	.28
—25	.28	......	......	25	3.24	3.45	.21	75	21.76	22.04	.28
—24	.29	......	......	26	3.39	3.60	.21	76	22.50	22.78	.28
—23	.31	......	......	27	3.55	3.76	.21	77	23.26	23.55	.29
—22	.32	.37	.05	28	3.71	3.92	.21	78	24.05	24.34	.29
—21	.34	.39	.05	29	3.88	4.08	.20	79	24.85	25.15	.30
—20	.36	.41	.05	30	4.05	4.25	.20	80	25.68	25.99	.31
—19	.37	.43	.06	31	4.22	4.42	.20	81	26.52	26.85	.33
—18	.39	.45	.06	32	4.40	4.60	.20	82	27.38	27.74	.36
—17	.41	.47	.06	33	4.58	4.78	.20	83	28.27	28.65	.38
—16	.43	.50	.07	34	4.77	4.98	.21	84	29.17	29.59	.42
—15	.45	.52	.07	35	4.97	5.17	.20	85	30.10	30.56	.46
—14	.47	.54	.07	36	5.18	5.38	.20	86	31.07	31.55	.48
—13	.49	.56	.07	37	5.39	5.60	.21	87	32.06	32.56	.50
—12	.51	.59	.08	38	5.61	5.82	.21	88	33.08	33.61	.53
—11	.53	.62	.09	39	5.84	6.05	.21	89	34.13	34.69	.56
—10	.56	.65	.09	40	6.08	6.29	.21	90	35.21	35.81	.60
— 9	.58	.68	.10	41	6.33	6.53	.20				
— 8	.61	.71	.10	42	6.59	6.79	.20				
— 7	.64	.74	.10	43	6.85	7.05	.20				
— 6	.67	.77	.10	44	7.13	7.32	.19				
— 5	.70	.80	.10	45	7.42	7.60	.18				
— 4	.74	.84	.10	46	7.71	7.89	.18				
— 3	.78	.88	.10	47	8.01	8.20	.19				
— 2	.82	.92	.10	48	8.32	8.51	.19				

RELATION OF THE DEW POINT TO THE INDICATIONS OF THE SLING PSYCHROMETER.

Almost the first observation gave the following result, determined after making the most careful preparations, and with all apparatus in excellent condition:

Dew point	—24.2°
Dry	—16.5°
Wet	—16.1°

This result showing dry .4° lower than wet was very *unsatisfactory*, but it had been foreshadowed as early as 1885. (See Professional Paper XVIII, p. 28.) It was plain that the air was nearly saturated and that the wet bulb reading was vitiated by the contraction of the ice on the wet bulb. The amount of this contraction could be measured quite accurately by dipping the ice-covered bulb and a bare bulb in a bottle of mercury kept at the air temperature. In this case no evaporation could take place from the ice, and hence the contraction was determined by simply comparing the thermometers in the bath. It was hoped that the amount of this contraction once determined for any bulb would remain constant for that bulb, but it was found impossible to wet a bulb twice in succession and make the ice sufficiently uniform to give the same contraction. The amount of the contraction depended on the thickness of the ice. The amount of the contraction with thick ice exceeded 1°. It was found necessary to measure the contraction for every observation and apply it as a correction to the wet bulb. It was quickly found that under certain conditions comparable results could not be obtained, and that it was very necessary to always have the temperature of the ice-covered bulb steadily fall from the beginning to the end. If the temperature rose at all, the ice seemed to take a set and the pressure was released from the bulb. After all these conditions were fulfilled it was possible to obtain fairly comparable results. A slight residual discrepancy, arising from the use of different-sized bulbs, seemed to arise from a slight difference in the evaporation.

An attempt was made to remove the difficulty from this contraction, as the operation of getting the contraction at each observation was exceedingly laborious and quite delicate for good results, certainly entirely out of the question in ordinary meteorological observations. If the contraction were uniform its effect could be allowed for, but even stripping off the muslin and wetting the bare bulb did not give a uniform contraction. It was thought that by mixing water with alcohol and wetting the bulb the alcohol could be evaporated off, leaving so thin a film of ice that its contraction would be inappreciable. On trying the experiment it was found that the compound was more or less stable, and while it did not freeze, yet the alcohol did not evaporate away as expected. It was also found that the contraction was entirely eliminated and that a fairly satisfactory result could always be obtained. At the first 100 swings or whirls the difference between the dry and wet was slightly too great, .5° to 1°, but after that the result was exactly correct, and it was only after 200 or 300 whirls that the difference became slightly too small, owing apparently to a nearly complete evaporation of the water. This method I regard as good and far preferable to the ice-covered bulb, which can never give an accurate result below 20° F. The method requires great care in its use for accurate results, and I accordingly sought other means of accomplishing the same purpose, *i. e.*, of preventing the contraction of the ice from affecting the reading.

If a very thin film of some substance impervious to water could be first placed on the bulb and that covered with muslin and wetted, the thin coat would take up the contraction, and no effect would be produced on the reading. No such substance could be found in the town, and I was unable to dissolve rubber in disulphide of carbon, so I was forced to use a covering of the "rubber dam" which had done duty before. This substance was much thicker than I wished, and if it had failed it would not have shown that the plan was impracticable. The "rubber dam" proved perfectly satisfactory, and there was little difficulty in getting comparable results by the three methods—first, plain ice in a mercury bath; second, water and alcohol; third, ice and "rubber dam."

It has been objected that the "rubber dam" would cause so serious a lagging that the bulb could not be cooled down as low as it should. This objection, however, does not hold, for not only was the result accurate at very low temperatures as compared with the contraction of the ice measured in a bath of mercury, but I could get the same result in a room where the temperature was above freezing with the ordinary wet bulb, and with the wet bulb having the "rubber dam" underneath the muslin. In this case the only precaution needed was to wet the bulb having the "dam" with water whose temperature was nearly or below that of the wet bulb. It was a remarkable fact that the air in all this region during the three months rarely had a relative humidity less than 80 per cent., and in consequence nearly all the observations that were made showed a difference of less than a degree between the wet and dry readings. The results obtained with these high humidities lay on either side of the table we now have, and no change will be advisable or possible until we obtain results at greater dryness. I had no means at my disposal to effect this dryness. One way in which it can be done at slight expense would be to cool down a room or barn to the outside temperature, supposing it —30° or —40°, then allow it to slowly warm up, the resulting humidity would be very small and results could be had with large differences between wet and dry. In a few experiments made at about 30° with 6° to 8° difference showed that the present formula is all right under those conditions.

HAIR HYGROMETER.

An instrument for recording humidity changes by the contraction and lengthening of a large number of hairs in a bunch and stretched between two uprights was sent to St. Vincent to be tested at very low temperatures. Careful comparisons were made between the sling psychrometer and this instrument, and these showed the latter entirely unreliable in its indications. This hair hygrometer has too great a range, and oftentimes shows a dryness 20 per cent. too great.

Respectfully submitted,

C. F. MARVIN,
Assistant Professor in Charge Instrument Division.

The CHIEF SIGNAL OFFICER.

APPENDIX 19.

REPORT OF THE OFFICER IN CHARGE OF THE PUBLICATIONS DIVISION.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, June 30, 1890.

SIR: I have the honor to submit the following report relative to the transactions of the Publications Division of this office for the fiscal year ending June 30, 1890.

The following named officers have been in charge during the fiscal year: Second Lieut. F. M. M. Beall, July 1 to 31, 1889; Second Lieut. James Mitchell, August 1 to 31, 1889; Second Lieut. F. M. M. Beall, September 1 to 30, 1889; Capt. James Allen, October 1 to 21, 1889; Second Lieut. W. D. Wright, October 22, 1889, to January 8, 1890; Second Lieut. James Mitchell, January 9 to 26, 1890; Capt. James Allen, January 27 to February 28, 1890; First Lieut. R. E. Thompson, March 1 to 31, 1890; and Capt. James Allen, April 1 to June 30, 1890.

The work of this division consists in printing and distributing the publications of the Service, and conducting the correspondence relating thereto. The notably high typographical character of the work performed has been maintained during the past year, and the current publications of the Service have been issued regularly and promptly.

In addition to the routine work the following extra printing has been done: 250 copies Bibliography of Meteorology, part II, Moisture; 500 copies notes, tables, and charts showing monthly normal rainfall in the United States; 500 copies Tri-daily Meteorological Record Charts, July to December, 1878; 500 copies charts showing mean monthly distribution of pressure and wind directions for the northern hemisphere north of 40° latitude, during 1882 and 1883; 500 copies international charts from July to December, 1884.

An improvement in the manner of addressing publications was made during the year by setting the names and addresses of the regular and voluntary observers and of persons listed to receive the same in type and printing instead of writing them, as heretofore. This change has resulted in much saving of time and labor in mailing the several publications of the Service, beside insuring greater accuracy for their prompt delivery.

The making of requisitions for printing and binding at the Government Printing Office and keeping the accounts of the work done there were turned over to this division during the year, thereby largely increasing the clerical work. The number of requisitions made on the Public Printer was 1,883.

Part 1 of the annual report of the Chief Signal Officer for the year 1889, printed at the Government Printing Office, has been received and distributed to all the regular and voluntary observers of the Service. This is largely due to the efficient management of that office.

The total number of employés in the division at the close of the year is 22, consisting of 15 enlisted men and 6 civilians, being an increase of 1 clerk (temporarily) since last report, which was made necessary by the accumulation of clerical work and additional correspondence.

Letters received and sent, and title and number of publications distributed during the fiscal year ending June 30, 1890.

Letters received	2,120
Letters sent	2,182
Annual reports of the Chief Signal Officer	2,432
Advance reports of the Chief Signal Officer, 1889	1,300
Weather (8 a. m. and 8 p. m.) maps	182,468
Monthly Weather Reviews	33,500
Annual Summary to Monthly Weather Review	3,000
Summary and Review of International Meteorological Observations	2,700
Weather Bulletins	16,695
Miscellaneous publications	5,268
Tri-daily Meteorological Record, June–December, 1878	3,368
Arctic series of reports	284

Bibliography of Meteorology, part II, Moisture	225
Professional Papers	93
Signal Service Notes	158
Bound Professional Papers (volumes)	21
Bound Signal Service Notes (volumes)	23
Senate Executive Documents, Nos. 91 and 282	98
Charts showing monthly rainfall, January, 1870–December, 1873	100
Bound volumes Monthly Weather Review	263
Total	256,298

Work performed in printing room during fiscal year ending June 30, 1890.

PRINTING.

Circulars	9,975
Envelopes	162,500
Forms	126,317
General and Special Orders	15,160
Letters	17,645
Letter heads	105,500
Monthly Weather Review	295,000
Annual Summary to Monthly Weather Review	12,000
Monthly Summary of International Meteorological Observations	11,000
Miscellaneous	54,954
Weather Crop Bulletin	16,695
Wrappers	23,500
Total	850,246

LITHOGRAPHING.

Base maps	197,107
Daily (8 a. m. and 8 p. m.) maps	192,468
Tri-daily maps	67,250
Daily International maps	52,008
Weather Review maps	51,989
Forms and circulars	27,558
Bibliography of Meteorology, part II, Moisture	28,500
Miscellaneous maps	21,404
Total	638,284

Very respectfully,

JAMES ALLEN,
Captain Third Cavalry, Signal Officer and Assistant, in charge Publications Division.

The CHIEF SIGNAL OFFICER.

APPENDIX 20.

REPORT OF ACCOUNTS DIVISION.

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, August 2, 1890.

SIR: I have the honor to submit the following report of the Accounts Division for the fiscal year ended June 30, 1890:

PERSONNEL.

Under Special Orders, No. 28, dated Headquarters of the Army, Adjutant-General's Office, Washington, February 2, 1889, I have continued on duty during the year as property and disbursing officer of the Signal Service.

While no changes of importance have occurred in the personnel of the division during the year, it is proper to say that since the reorganization of the force at this office on October 2, 1888, this division has lost the services of 15 experienced clerks, who have resigned for the purpose of accepting appointments elsewhere, or who have been transferred to other branches of the Government service.

CHANGE OF DESIGNATION.

For the purpose of more explicitly indicating the character of the work performed by this division, its designation was changed on January 6, 1890, from "Disbursing Division" to "Accounts Division," the official title of the disbursing officer remaining the same as before.

CLASSIFICATION OF WORK.

The classification of work indicated in my report for the last fiscal year has remained practically the same; in order to equalize the work some slight changes have been necessary, owing to changes in methods of business.

APPROPRIATIONS.

The condition of the appropriations (disbursed by this office) for the fiscal year ended June 30, 1890, with the expenditures thereunder, the balances and the probable demands on such balances, report of which is required to be rendered by the act of Congress approved May 20, 1820, is as follows:

Appropriated:	
Observation and report of storms	$236,240.00
Signal Service:	
Regular supplies	9,200.00
Incidental expenses	317.00
Transportation	19,000.00
Signal Service pay	354,555.10
Medical department	2,600.00
Signal Service of the Army	*5,110.40
Expended:	
Observation and report of storms	102,238.94
Signal service:	
Regular supplies	6,481.02
Incidental expenses	168.92
Transportation	9,366.45
Signal Service pay	313,243.17
Medical department	1,391.20
Signal Service of the Army	5,088.25

* Includes $110.40 transfered from Navy Department.

Balances:	
Observation and report of storms	$134,001.06
Signal service:	
Regular supplies	2,718.98
Incidental expenses	148.08
Transportation	9,633.55
Signal Service pay	41,311.93
Medical department	1,208.80
Signal Service of the Army	22.15
Probable demands:	
Observation and report of storms	119,689.95
Signal Service:	
Regular supplies	285.73
Incidental expenses	13.83
Transportation	8,401.89
Signal Service pay	37,472.32
Medical department	124.15
Signal Service of the Army	21.99

Amounts appropriated under the different heads for the support of the Signal Service, U. S. Army, for the fiscal year ended June 30, 1890.

Legislative, executive, and judicial:		
Regular clerks and messengers	$153,960.00	
Printing and binding	10,000.00	
Postage stamps (allotted by Secretary of War)	500.49	
Stationery (allotted by Secretary of War)	3,500.00	
Contingent expenses (allotted by the Secretary of War)	7,250.00	
		$175,210.49
Observation and report of storms:		
Manufacture, purchase, etc., of instruments	9,000.00	
Telegraphing reports	118,000.00	
Rents, etc., of offices outside of Washington	44,000.00	
Expenses of storm signals	10,000.00	
River and flood reports	9,000.00	
Cotton region reports	7,000.00	
Maps and bulletins	14,500.00	
Telegraph lines	*24,740.00	
		236,240.00
Pay, etc., of Signal Corps:		
Pay and quarters of officers	36,352.00	
Mileage to officers	2,500.00	
Pay of enlisted men	315,703.10	
		354,555.10
Signal Service: Regular supplies.		
Fuel for officers and for sale to officers	7,000.00	
Forage for public animals	2,200.00	
		9,200.00
Incidental expenses:		
Shoeing public animals	162.00	
Blacksmiths' supplies	100.00	
Interments	25.00	
Veterinary supplies	30.00	
		317.00
Signal-Service transportation		19,000.00
Medical department		2,600.00
Signal Service of the Army		5,000.00
Grand total		$801,122.59

COST OF STATIONS OF OBSERVATIONS.

The average cost of maintaining each meteorological station during the year (exclusive of the cost of stationery, etc., sent from this office, of telegraph service, and of the pay and allowances of the enlisted force on duty at each) has been $313.86.

The station costing the least is Fort Bowie, Ariz. T., $1.61 only having been expended thereat during the year. The station costing the most is Chicago, Ill., at

* This includes $1,740 deficiency appropriation.

which the sum of $1,920.23 was spent during the year. There were four stations maintained during the year without cost, except for telegraph service and pay of enlisted force, viz: Auburn, Ala.; Lansing, Mich.; New Brunswick, N. J., and Fort Supply, Ind. T.

SALES OF PUBLICATIONS.

Three hundred and twenty-eight dollars and ninety-five cents have been received during the year from the sale of maps and bulletins, as allowed by the act of Congress approved March 30, 1874, (section 227, Revised Statutes). The amount was deposited with the Treasurer of the United States to the credit of the appropriation "Observation and Report of Storms" for the then current fiscal year.

CONTRACTS.

As required by the act of Congress approved April 21, 1808 (Statutes at Large, Vol. 2, p. 435), I submit herewith list of contracts made during the fiscal year ended June 30, 1890:

With whom made.	For what purpose.
L. N. Heil	Lease, Montrose, Colo.
N. Cramer (administrator)	Lease, Manistee, Mich.
N. H. Owings	Lease, Olympia, Wash.
Jos. Perrault	Lease, Boisé City, Idaho.
E. B. Hyde	Lease, Spokane Falls, Wash.
C. H. Eberle	Lease, Fort Smith, Ark.
Courier-Journal Company	Lease, Louisville, Ky.
John F. Valls	Lease, Brownsville, Tex.
George French	Lease, Corpus Christi, Tex.
Chamber of Commerce	Lease, Sioux City, Iowa.
L. G. Nesmith	Lease, San Diego, Cal.
B. F. Crouch	Lease, Linkville, Oregon.
Taylor Bros	Lease, Taylor's Ranch, Utah.
Anna M. Grover	Lease, Keeler, Cal.
Emeline W. Look	Lease, Vineyard Haven, Mass.
Easton & Rupp	Contract, paper.
A. G. Elliott & Co	Do.
Rider & Addison	Do.
The E. S. Greeley & Co	Contract, flags.
Roberts Brothers	Do.
D. Provoost's Sons & Co	Do.
Easton & Rupp	Contract, stationery.
Ballantyne & Son	Do.
Clendenin Bros	Contract, Telegraph supplies.
The E. S. Greeley & Co	Do.
Merchants' Exchange Association	Lease, San Francisco, Cal.
Chamber of Commerce	Lease, St. Paul, Minn.
Cotton Exchange	Lease, Galveston, Tex.
W. J. Nesbitt	Lease, Micco, Fla.
E. F. Gould	Lease, Atlanta, Ga.
Baer & Blotch	Lease, Baker City, Oregon.
G. M. Hall	Lease, Pueblo, Colo.
Pacific Club	Lease, Nantucket, Mass.
Walker & Hall	Lease, Meridian, Miss.
Jacob B. Perkins	Lease, Cleveland, Ohio.
P. Rosbach	Lease, Grand Haven, Mich.
Catharine Wilson	Lease, Los Angeles, Cal.
Bryant, McEachin & Luce	Lease, Fort Smith, Ark.
P. Rosbach	Lease, Grand Haven, Mich.
J. D. Free, jr	Contract, Milliographs.
R. S. Dodson	Lease, Norfolk, Va.
Auditorium Association	Lease, Chicago, Ill.
Masonic Temple	Lease, Davenport, Iowa.
J. G. Payne (Attorney, etc.)	Lease, Lynchburgh, Va.
Cone & Kimball	Lease, Red Bluff, Cal.
L. N. Heil	Lease, Montrose, Colo.
Taylor & Lee	Lease, Taylor's Ranch, Utah.

With whom made.	For what purpose.
Auditorium Association	Lease, Chicago, Ill.
Porter, Reeves & Co	Lease, Abilene, Tex.
Board of Trade	Lease, Columbus, Ohio.
The Bank Building Association	Lease, Colorado Springs, Colo.
Staples & Pelan	Lease, Dubuque, Iowa.
Pacific Club	Lease, Nantucket, Mass.
Jacob B. Perkins	Lease, Cleveland, Ohio.
C. M. Beeson	Lease, Dodge City, Kans.
Lorenzo Littlefield	Lease, Block Island, R. I.
Thomas E. Hughes	Lease, Fresno, Cal.
Board of Trade	Lease, Buffalo, N. Y.
F. E. Warren	Lease, Cheyenne, Wyo.
John F. Valls	Lease, Brownsville, Tex.
J. B. Grady	Lease, Eastport, Me.
H. H. Buhne	Lease, Eureka, Cal.
Homer W. Styron	Lease, Hatteras, N. C.
Lucius M. Sheldon	Lease, El Paso, Tex.
Bolton & McRae	Lease, Alpena, Mich.
George H. C. Neal	Lease, Baltimore, Md.
Geo. W. Williams	Lease, Charleston, S. C.
P. Rosbach	Lease, Grand Haven, Mich.
American Exchange Bank	Lease, Duluth, Minn.
George French	Lease, Corpus Christi, Tex.
Bryant, McEachin & Luce	Lease, Fort Smith, Ark.
Emeline W. Look	Lease, Vineyard Haven, Mass.
J. M. Klein	Contract, Construction of telegraph lines.

A separate report of this has been prepared and submitted to the Honorable the Secretary of War for transmission to Congress.

INCREASES IN RENTS.

In executing new leases for the fiscal year, several demands were made for an increase in the total amount to be paid; in all cases but two the demand was successfully resisted. At Nantucket and at Vineyard Haven, Mass., it was shown that the amounts previously paid had not been proportionate to the conveniences received, and the increase asked having been considered just and reasonable was allowed, amounting, in the case of Nantucket, to $39, and in the case of Vineyard Haven, to $34, per annum.

ESTIMATES.

The estimate for appropriations submitted on September 13, 1889, for the fiscal year ending June 30, 1891, aggregate for the entire Service, including Signal Service proper, the sum of $849,272.50, made up as follows:

Signal Service of the Army		$10,000.00
Postage		500.00
Contingent expenses		20,072.50
Stationery		6,250.00
Rent of stable		360.00
Printing and binding		12,000.00
Observation and report of storms:		
Manufacture of instruments, etc	$8,700.00	
Telegraphing reports	120,000.00	
Rent, etc., of offices	45,000.00	
Expenses of storm signals	11,000.00	
River and flood reports	13,000.00	
Cotton region reports	5,000.00	
Maps and bulletins	15,000.00	
Maintenance, etc., telegraph lines	25,155.00	
		242,855.00
Salaries		156,000.00
Forage, etc., public animals		1,175.00
Transportation		18,000.00
Clothing		14,800.00
Construction of storehouse		1,565.00

Signal Service: Pay, etc.—

Brigadier-general	$5,500.00	
Second-lieutenants	21,000.00	
Longevity pay	5,400.00	
Mileage	2,700.00	
Commutation of quarters	4,752.00	
Forage for private horses	1,217.00	
Fuel for officers	1,232.00	
Medical attendance, etc	2,600.00	
Pay and allowances of enlisted men	$321,294.00	
		365,695.00
Total		$849,272.50

This is a net increase over the amount appropriated for the fiscal year ended June 30, 1890, of $49,389.91, of which amount, the sum of $28,110 covered *new* items; excluding them, the actual net increase in *regular* items amounted to $21,279.91, being $21,068.24 *less* than the amount of the estimates submitted for the fiscal year ended June 30, 1890, and $23,733.77 *less* than the total amount appropriated for the fiscal year ended June 30, 1889; *including* the *new* items the sum asked for is an increase of *only 6 per cent.* over the *amount* appropriated for the fiscal year ended June 30, 1890, while, judging from the experience of the two preceding fiscal years, the volume of business for the fiscal year ending June 30, 1891, will be at least 20 per cent. larger than at any time in the past.

PRINTING AND BINDING.

The estimate submitted by this office for an appropriation for printing and binding for the fiscal year ended June 30, 1890, was for $12,000. Congress appropriated the sum of $10,000, all of which was used; requisitions aggregating nearly $700 could not be acted upon owing to the fact that the appropriation had been exhausted.

From the experience of the past it has been found that an average of $12,000 per annum is required, to include $1,000 for the publishing of Professional Papers and Signal Service Notes for distribution to voluntary observers.

The utility of this service to agriculture and other interests would be largely subserved by authorizing the occasional publication of meteorological papers having a practical bearing upon matters of general public utility, such as irrigation, effect of weather upon crops, etc., and in this manner the special wants of coöperating observers, who give gratuitously their time and observations, would be acknowledged and subserved by a free distribution of such papers to them.

TRANSPORTATION OF SIGNAL EQUIPMENTS AND STORES.

During the fiscal year there has been expended out of the appropriation for "Signal Service: Transportation" the sum of $1,200 to cover the shipment of stores intended solely for military purposes, and as the item had not been included in submitting the estimates on which said appropriation was based, it having been considered that the cost of said transportation was a proper charge against the appropriation for the transportation of the Army, and in order to avoid a deficiency in the item "Signal Service: Transportation," an estimate under the item "Signal Service of the Army" was submitted for the amount necessary to reimburse the said appropriation for transportation.

A decision has been rendered during the year by the Second Comptroller of the Treasury in effect that the expense of transportation of certain signal supplies for the use of the Army was payable from the appropriation for the "purchase, equipment, and repair of field electric telegraphs," notwithstanding the fact that there were two specific appropriations for transportation, one in the Army bill and one in the sundry civil bill, the former under the control of the Quartermaster-General and the latter under the control of the Chief Signal Officer, but the Army bill for the fiscal year ending June 30, 1891, contains the necessary appropriation for such transportation, so that hereafter the cost will be borne by the appropriation properly chargeable with the expense.

DIGEST OF APPROPRIATIONS.

In digesting the appropriations for the fiscal year ended June 30, 1889, the Secretary of the Treasury admitted that this office was entitled under the item of mileage to the sum of $2,882.19; notwithstanding this fact, the Second Comptroller refused to allow and pay the claim of an officer of the Signal Corps for mileage, amounting to $301.09, for the reason, as alleged, that the original Joint Resolution continuing the appropriations, contained a limiting clause which would not permit the total appropriation for the fiscal year ended June 30, 1889, to exceed the amount which would have been specifically appropriated for that year if the appropriation had been made in ample time. This decision was in the face of the fact that, under the Joint Resolution, the office was entitled to a certain proportion of the appropriation made for the previous fiscal year added to a certain proportion of the appropriation to be made for the then current fiscal year. The result of this decision of the Second Comptroller has been to place the officer interested, as well as the Chief Signal Officer, in a most embarrassing position. It forced the former to pay from his personal funds the expenses incurred by him in the performance of an official duty; it placed the latter in the position of having either willfully or ignorantly violated the express provision of law that he shall not incur in any one fiscal year a sum in excess of the appropriations made by Congress for the service of that year, and although it is a fact there is a sum in the Treasury to the credit of the appropriation sufficient to meet the claim, the accounting officers of the Treasury have preferred to submit the matter to Congress for a deficiency appropriation.

PAYMENTS TO ENLISTED MEN.

I desire to invite special attention to the great saving of labor and early receipt of the checks by them, which have resulted from the change in the method of paying the enlisted men of this Service, brought about (at the suggestion of this division) by the provision in the appropriation act for the fiscal year ended June 30, 1890, which required that the appropriations for pay proper, for commutation of rations, for commutation of fuel, and for commutation of quarters should be paid monthly to each enlisted man entitled thereto, by one check, upon one properly certified voucher, and constituting for that purpose the several appropriations mentioned into one fund, and by the decision of the Honorable the Secretary of War, under date of June 4, 1889, that the disbursement of this fund should be made by the regularly bonded disbursing officer detailed for duty with the Signal Service. By the plan referred to it has required an average of 300 checks per month to pay the enlisted men of this Service; under the old system it required at least three times that number of checks, with an endless amount of circumlocution to effect the same result. The checks under the present plan have been drawn and mailed on the last working day of the month to each enlisted man.

DEPOSITS OF ENLISTED MEN.

During the year a question arose as to the proper construction of the act making appropriations for this Service in regard to the payment of the enlisted force, so far as the same related to the disposition of the deposits of said enlisted men. The matter was submitted to the Honorable the Secretary of War and decision rendered by him in effect that as under his decision of June 4, 1889, before referred to, the enlisted men of the Signal Corps should be paid by the disbursing officer of this Service said men should make their deposits through him.

By the special provisions to be incorporated in the appropriation act for the fiscal year ending June 30, 1891 (Sundry Civil), all these matters will be regulated by specific law.

ACCOUNTS SETTLED.

The number of accounts, including those for the pay and commutations due the enlisted force, required in the disbursement of the various appropriations under the control of this office, settled during the year, is 10,491, distributed as follows:

July, 1889	1,179	January, 1890	1,021
August, 1889	782	February, 1890	754
September, 1889	843	March, 1890	672
October, 1889	1,106	April, 1890	942
November, 1889	786	May, 1890	612
December, 1889	718	June, 1890	1,076

ACCOUNTS UNSETTLED.

On June 30, 1890, there were 64 unsettled accounts, of which 25 had been returned for correction, etc., and had not been received back; of the 39 accounts remaining in the division, 18 were bills of the Western Union Telegraph Company, which could not be disposed of, owing to demurrer on the part of said company to the rates fixed by the Postmaster-General for the fiscal year ended June 30, 1890, and 21 were held for certain data to enable a proper audit to be made, and for other reasons which prevented them being put in course of settlement; there were, therefore, no accounts in this division on June 30, 1890, available for settlement.

RENDITION OF MONEY ACCOUNTS.

The accounting officers of the Treasury have, during the year, called attention to the importance of strictly following the requirements of law and rendering money accounts promptly at the end of each month; while this division has followed these requirements, it is proper to invite attention to the fact that, notwithstanding the accounts of the disbursing officer of this service are so transmitted, they are allowed to accumulate in the Treasury Department without examination for many months; at least no result of such examination has been communicated to this office. This is neither fair to the disbursing officer nor to the Government, and some steps should be taken to remedy this evil.

SUSPENSION OF MONEY ACCOUNTS.

No information has been received during the year from the accounting officers of the Treasury as to the examination of my accounts, and no statement can therefore be made in regard to the status of those accounts in the Treasury Department. It is believed, however, that the strict examination which the accounts undergo at this office, both in their preparation and final verification before they are sent to the Treasury Department, is sufficient to discover any errors, and the accounts are generally in very good shape, although it would be advisable if (as stated in the preceding paragraph) the accounts of the disbursing officer could be more promptly examined by the Treasury Department and he be informed of the result of that examination, say within 6 months after submitting his accounts; at present, it is several years usually before a disbursing officer is advised of the result of the examination of his accounts, and then, if vouchers are suspended for any technical objection, it may happen, owing to the lapse of time, that it is not within the power of the officer to have such vouchers remedied.

INSPECTION OF MONEY ACCOUNTS.

My money accounts have been inspected and the balances verified by the Inspector-General's Department as follows: October 30, 1889, by H. Clay Wood, lieutenant-colonel and assistant adjutant-general; March 3, 1890, by H. Clay Wood, lieutenant-colonel and assistant adjutant-general; June 26, 1890, by P. D. Vroom, major and inspector-general.

RECEIPTS AND SHIPMENTS.

In the packing and shipping room 6,310 distinct shipments have been made through the Quartermaster's Department, by mail and by express, and 1,547 consignments received.

There were 6 requisitions remaining unfilled at the close of the fiscal year.

PROPERTY RESPONSIBILITY.

Under the act of Congress, approved October 12, 1888 (as stated in my previous report), the transfer of the property at the various stations to the enlisted men of the Signal Corps was effected on December 31, 1888; the regulations issued at that time governing the accounting for property, although prepared with much care, were found after experience to be wanting in some particulars, especially in matters of detail, where the judgment of the various enlisted men was found to be not alike, and the result was consequently lacking in that uniformity which was aimed at in suggesting the method of accounting for the property. To remedy this, a circular was issued on the 1st of January, 1890, which more clearly defined the meaning of certain paragraphs and divided the property into three classes or groups, respectively, as follows: Group X, property of an expendable character; group Y, property partaking of the nature of expendable property; and group Z, property of an unexpendable nature. A change was also made in the manner of invoicing property, so that it would be invoiced as soon as shipped instead of quarterly, as had been the custom before, and also applying to the stations outside of Washington, in their transactions with one another, the system of invoicing and receipts in vogue between this office and such stations.

These changes have resulted in a greater uniformity, and have demonstrated the wisdom of promulgating them, by an increased accuracy and considerable lessening of labor.

SALES OF PROPERTY.

The following statement shows the amounts received from sales at auction of condemned property, the dates upon which sold, and the stations at which the sales took place. The amount received was regularly covered into the Treasury of the United States as required by law.

Date.	Station.	Property.	Amount.
1889.			
July 29	Marquette, Mich	Office furniture, flag-staff, etc	$24.62
Aug. 26	Montrose, Colo	Two stoves	2.00
Aug. 20	Detroit, Mich	Office furniture	12.00
Sept. 7	O. C. S. O	Condemned property	186.20
Sept. 21	Ft. Grant, Ariz	2 wind-vanes	1.00
Nov. 2	Ashland, Oregon; Klamath, Oregon	Telegraph material, Fort Klamath-Ashland line.	60.00
1890.			
Feb. 27	Baltimore, Md	Office furniture	3.99
Mar. 11	Southport, N. C	Cart, saddle, halter, etc	10.86
Mar. 29	Phœnix, Ariz	Telegraph material, supplies, etc	27.45
Mar. 19	La Crosse, Wis	Carpet, etc	3.27
Mar. 25	Southport, N. C	4 cisterns, material, etc	2.00
Apr. 1	Atlanta, Ga	Stove and fixture	1.00
Apr. 28	Indianapolis, Ind	Office furniture	16.60
May 15	Fort Clark, Tex	Signal equipment, etc	.70
June 2	Titusville, Fla	Cart, harness, office furniture, etc	3.60
June 5	Cape Henry, Va	Furniture, mule, etc	75.50
June 20	Buffalo, N. Y	Wind-vane	no bid.
June 5	Cairo, Ill	Wind-vane and table	1.00
June 21	Los Angeles, Cal	Office furniture	4.15
June 30	Shreveport, La	Supports, wind-vane	.50
June 30	O. C. S. O	Condemned property	108.44
	Total		544.88

TELEGRAPH LINES SOLD.

The number of miles of telegraph line sold at auction during the year is 457; the amount received for the same is $614.65, which was properly deposited in the Treasury as required by the regulations.

The lines sold are as follows:

Date.	Description.	Miles.	Amount.
1889.			
Dec. 16	Fort Laramie-Bordeaux	28	$13.50
Nov. 2	Klamath-Ashland	100	180.00
Aug. 19	Fort Crawford-Montrose (no bid)	9	....
1890.			
Apr. 25	Fort Crawford-Montrose (readvertised and sold)	9	94.55
May 5	Part of Fort Thomas-Fort Grant	12	16.00
June 13	Cantonment to Woodward	46	5.00
June 30	Maginnis to Kintyre, including material	186	134.10
June 30	Whipple Barracks to Verde	40	41.50
May 3	Fort McDowell to Phœnix	27	130.00
	Total	457	614.65

POINT REYES TELEGRAPH LINE.

Owing to the breaking beyond repair of the United States submarine cable, between Black Point and Alcatraz Island (San Francisco Harbor), it became necessary to submit an estimate for a deficiency appropriation of $1,740 for the rental of a core in the Western Union Company's cable, and for the construction of 12 miles of land line, this having been considered a more reliable and economical method of securing telegraphic communication than to put in a new cable in place of the one damaged.

Congress having appropriated the necessary amount, the work was started under the supervision of Lieut. J. E. Maxfield, and is progressing as rapidly as is possible consistent with good workmanship.

SUPERINTENDENCE OF BUILDINGS.

In the interest of economy, and in order to secure an efficient administration of the public business, recommendation was made to the Honorable the Secretary of War that the buildings and grounds at the corner of Twenty-fourth and M streets, in which the Signal Office is located, be placed, so far as their care and preservation were concerned, under the supervision of the superintendent of the State, War, and Navy Department buildings. This being approved by the Honorable the Secretary of War, Chief Engineer Thom Williamson, U. S. Navy, superintendent of the State, War, and Navy Department buildings, was detailed as the superintendent, and a necessary force for heating, guarding, and cleaning was transferred to him, with a sufficient amount of money to enable him to properly carry out the object of the recommendation.

Chief Engineer Williamson took charge on October 3, 1889, and the relief from the care of the buildings and grounds, part of which demanded the services of an expert, is appreciated.

OFFICE AND STORAGE ACCOMMODATIONS.

As mentioned in my report for the fiscal year ended June 30, 1889, the building erected under the direction of the Supervising Architect of the Treasury has required considerable repairs to keep it in a tenantable condition. Estimates were submitted for an appropriation to cover certain necessary items of expense required in order to protect the building and grounds, for the economical handling of the stores, and to improve the heating and sanitary arrangements. These items aggregated $9,585, which sum Congress, at this writing, has failed to embody in any appropriation act. A deficiency estimate was also submitted for $9,825 for improving the water-closets, enlarging the heating facilities, increasing the drainage, and painting the roofs, and making such other pressing repairs required to preserve the main and annex buildings of the Signal Service. Congress appropriated the sum of $9,500, which was placed under the control of Chief Engineer Thom Williamson, the superintendent of the State, War, and Navy Department buildings, by whose direction it is being most judiciously expended, and while all the work has not been completed it has been started, and is progressing as rapidly as first-class workmanship will admit. It is to be hoped that when the work shall be completed the buildings will be in a fair state of repair, but in order to keep them so a sum of not less than $5,000 should be annually appropriated.

RENT OF STABLE.

At present the stable is located on the lower floor of the building which was erected on the corner of Twenty-fourth and M streets, under the provisions of the act of Congress approved February 25, 1888, the upper floor of said building being occupied by clerks and other employés.

The close proximity of the stable to the rooms used by the clerical force of the office is exceedingly unpleasant, and as the space is needed for storage purposes an estimate was submitted for an appropriation of $360 for the rent of a stable, but Congress has failed to incorporate the item in any appropriation act thus far reported. It is necessary that some action should be taken in the matter to have such an appropriation made available.

CONDITION OF TWENTY-FOURTH STREET.

On August 23, 1889, request was made of the District Commissioners to have Twenty-fourth street between Pennsylvania avenue and M street concreted, said street being paved with cobble stones and not in very good state of repair, but up to this time the same has not been done, and as the street is much traveled by public and private vehicles action should be taken to have it put in good condition.

OFFICES IN PUBLIC BUILDINGS.

Although there are public buildings at Columbus, Ohio, Carson City, Nev., Kansas City, Mo., Little Rock, Ark., Leavenworth, Kans., Memphis, Tenn., Nashville, Tenn., Santa Fé, N. Mex., Baltimore, Md., Manchester, N. H., El Paso, Tex., and

Dubuque, Iowa, this Service has been unable, through lack of room or other causes, to secure accommodations in said buildings, and it is therefore suggested that the Treasury Department be asked to make specific provisions (in its future estimates for public buildings) for offices for use of the Signal Service, such offices to be not above the second floor in buildings having no elevators, and to be below the attic floor in those having elevators. Provisions should also be made for necessary approaches to the roof, board-walks thereon, the erection of the instrument shelter and instruments, flagstaff for display of signals, and a proper outfit of furniture.

It is claimed at the Supervising Architect's office of the Treasury Department that unless specific provision is made by Congress for quarters for the Signal Service in any public building the occupancy by this Service of any such building is permitted through the courtesy of the Supervising Architect, and can not be considered a matter of right. It is desired, therefore, that either a general enactment be passed by Congress covering the matter, or else this Service should be specifically mentioned in *each* act providing for the construction of a public building at points where Signal Service stations may be located.

FORMS.

Owing to changes recommended by the board on forms in the nomenclature and numbering of forms, and the discontinuance of all forms not absolutely necessary, the work of issuing the forms for use at stations has been very much simplified.

There have been 192 forms renumbered, 44 consolidated, and 305 discontinued.

There have been mailed 7,214 packages, covering about 2,500 requisitions; there were 67 requisitions on hand unfilled on June 30, 1890, and they had been received during the month of June.

REGISTERING OFFICIAL MAIL.

Some arrangement should be made, it would seem, by which official mail matter (which might be considered of sufficient importance or value to require it) sent to this office by its employés and agents outside of the city of Washington could be registered free of charge. At present mail matter upon the official business of this Bureau forwarded from this city, and which requires registering, is registered without the payment of any fee and passes through the mails free of charge, and it is desirable to have the same privilege extended to the officers and employés of the Service on duty outside of Washington, D. C.

It is unbusinesslike that all Departments of the Government except the Post-Office Department should be required to purchase, use, and account for stamps for registering important mail matter carried by the latter.

NEW WORK ASSIGNED.

In addition to the work of paying the enlisted men mentioned elsewhere, there has been transferred to this division during the year the work of requesting transportation for officers and enlisted men. This was done in order that there might be a proper check upon the appropriation for transportation, and by the application to this item of the coupon system of orders devised by this division (which had been in successful operation for the past 7 years) the status at any time of the appropriation for transportation might be determined, and the plan has aided in a judicious and economical distribution of the fund available for transportation.

INSTRUMENTS FOR VOLUNTARY OBSERVERS.

The records and so much as had been performed by this division of the work of issuing instruments to voluntary observers has been during the year transferred to the records division, for the reason that said division had charge of the voluntary observations and was better able to judge of the needs and interests of said observers in the way of instruments and records, and being in constant correspondence with them was better prepared to take charge of the work.

CORRESPONDENCE.

The total number of letters received during the year is 16,848, containing 34,286 inclosures, of which 5,713, being mere letters of transmittal for bills or accounts, were not regularly recorded in the records. The total number of letters sent out is 19,762, which includes 1,107 indorsements.

CARD SYSTEM OF RECORDS.

One of the most important changes that has taken place in the methods of business of this division is the introduction of the card system of letters received on the plan devised and suggested by this division. It has been in operation for the past year and has saved considerable time and labor in the handling and recording of letters received, enabling the services of one clerk to be dispensed with in this branch of work.

By the card-index system the current mail is handled more quickly and disposed of more expeditiously than under the old and cumbersome book method, and considerable less time is consumed in locating papers.

The statement following shows in detail the number of cards opened each month of the fiscal year for names and subjects:

Months.	No. of letters received.	No. of cards opened.		Per cent. of whole number of cards for year opened each month.	
		Writer.	Subject.	Writer.	Subject.
1889.					
July	1,043	533	227	30	48
August	919	235	60	13	13
September	900	169	32	9	7
October	973	178	37	10	8
November	840	117	26	7	5
December	1,002	96	20	5	4
1890.					
January	908	90	19	5	4
February	852	87	13	5	3
March	1,086	86	12	5	3
April	1,029	72	10	4	2
May	792	60	8	3	2
June	791	67	4	4	1
Total	11,135	1,790	468	100	100

ADVERTISEMENTS AND PROPOSALS.

During the year there were issued 210 advertisements (in the shape of circulars) inviting proposals.

In calling for bids a plan has been adopted which has worked most satisfactorily, and that is to require the successful bidder to deposit a certified check for not less than one-tenth the amount of his bid (the amount to be determined at time of award), said amount to be forfeited to the United States in case of failure on the part of said bidder to fully comply in each and every particular with the terms of the award, according to the true intent and meaning thereof.

In order also to secure prompt deliveries, there has been inserted a special agreement by which the contractor was made to forfeit to the United States, for each and every day in excess of 20 days (except in special cases) required to deliver the goods after the receipt of the order, the sum of not less than 1 per cent. of the amount of the order, the contractor being thus made to suffer for his delays and defaults when it was found that they could have been avoided; the result has been to secure a more expeditious delivery on all orders issued than heretofore.

OPEN MARKET PURCHASES.

On January 24, 1890, recommendation was made that the limit then fixed, namely, $5 for purchases in open market, be increased to $20; this recommendation was based upon an experience of several years, and was offered with the belief that the interests of the Government would be fully subserved by allowing a proper discretion in such cases where the amount involved did not exceed $20, so that formal proposals might be invited or not, as the circumstances of each particular case might seem to demand; after an informal consultation with the Treasury Department, the recommendation as made was approved, and the result has been highly satisfactory. It has materially reduced the number of formal proposals, thereby lessening the work not only of this office but of the accounting officers of the Treasury, where such papers had to be subsequently handled and filed, and, it is confidently believed, without increasing the cost to the United States.

REQUISITIONS AND ORDERS.

There were made during the year on the Supply Division of the War Department the following requisitions:

For stationery	122
For miscellaneous articles	151
For books and periodicals	13
Total	286

There were also issued the following:

Orders on contractors	464
Letters of authority to stations	696
Total	1,160

Referring to the allotments to this office of the appropriations for "Stationery" and for "Contingent Expenses" of the War Department and its Bureaus, it is suggested, instead of making requisitions as now on the Supply Division of the War Department for such articles as may be needed under the allotments mentioned, that this office be allowed to purchase or procure directly from the contractors or otherwise such articles as may be required for use in this Bureau, and forward properly approved accounts therefor to the disbursing clerk of the War Department for payment.

This suggestion is made in view of the fact that, as the Signal Office is situated so far away from the Supply Division, the base of supplies, much time is lost and delay experienced in complying with the formalities required to obtain even the most inexpensive but necessary articles. Besides, on several occasions, it has been noticed that articles could be procured from dealers direct, not only in less time, but for less money than they could be obtained from or through the Supply Division of the War Department, and also for the more important reason that the Chiefs of Bureaus are required to submit estimates for the funds required and are personally called upon to explain, before the Appropriation Committees of Congress, the necessity for the sums asked, and the said chiefs are morally responsible for the proper expenditure of the appropriation when made.

Under the present arrangement this office is required to submit a formal requisition for the most trivial article, being obliged to make out a requisition on a special blank (blue paper) for any article of stationery which may happen to be on the regular schedule, a separate similar requisition for any article not on the schedule; to make a requisition on a special blank (yellow paper) for any article of a miscellaneous character on the regular schedule, a separate similar requisition for any article not on the schedule; to make a requisition on a special blank (white paper) for any book or periodical which may be desired, entailing a useless expenditure of time and labor on a plan, it may be added, which hardly seems to be in accord with proper business methods.

The methods of this Bureau are such that the exact status of each of the appropriations disbursed by this office, aggregating hundreds of thousands of dollars, is shown each day by means of a rough balance sheet, from which is prepared at the close of business at the end of each month a detailed statement showing the amounts available; but this plan is not possible in connection with the allotments for stationery and contingencies as now handled.

CLERICAL FORCE.

On July 1, 1889, there were employed in this division 71 persons—3 enlisted men and 68 civilians; the 71 employés being distributed as follows: Clerks, 0 enlisted men and 25 civilians; mechanics, messengers and laborers, 3 enlisted men and 43 civilians.

On June 30, 1890, there were employed in this division 60 persons; 3 enlisted men and 57 civilians; the 60 employes being distributed as follows: Clerks, 0 enlisted men and 22 civilians; mechanics, messengers, and laborers, 3 enlisted men and 35 civilians.

It will be noticed that there were on duty on June 30, 1890, 3 clerks less than on

July 1, 1889, yet the work has been kept well in hand, and at this time there is no unfinished business, except that which has accumulated in the last month, on account of the opening of the bids for the annual supplies, and even this work is well under way and will soon be disposed of.

This state of things has been largely brought about by the plan proposed last year by this division to include in the leases the various items of expense incidental to the hiring of offices, such as heat, light, janitor services, etc., thus not only reducing the number of small accounts, but securing a more efficient service.

CARPENTER SHOP.

In the carpenter-shop the usual quantity of work has been done, consisting of jobbing and repairs about the office, and the two men employed have been busily engaged during the entire year.

INCREASE OF SALARIES.

While all the clerks of the Accounts Division are to be commended for faithful and efficient work, yet the gentlemen who are in charge of sub-divisions or sections are particularly to be praised for the energetic manner in which they have pushed the work of the division during the fiscal year ended June 30, 1890, making it possible to do more work with a less number of clerks than could have been done otherwise.

These clerks receive but $1,200 per annum each, and it is submitted that the pay is not commensurate with the responsibility which attaches to their positions. I would suggest that in submitting future estimates for salaries provision be made for 1 clerk of class 3 and 3 of class 2 for this division, in lieu of 1 clerk of class 2 and 3 clerks of class 1.

Very respectfully,

ROBT. CRAIG,

Captain and A. Q. M., U. S. A., Disbursing Officer, Signal Service.

The CHIEF SIGNAL OFFICER.

APPENDIX 21.

REPORT OF THE EXAMINER'S DIVISION.

SIGNAL OFFICE,
Washington City, July 23, 1890.

SIR: I have the honor to report that for the first time in the history of the division, the examination of all property returns had been completed at the end of the fiscal year, and all but three accounts-current had received critical scrutiny. The final disposition of the arrearages of back years was also involved in the general cleaning up.

On January 1, 1890, new methods were introduced into the system of property accountability. Part of the material of an expendable nature—that is, of the kind which would naturally be used up in the course of public business—was then ordered to be carried upon a statement independent of the return which embraces only articles of a permanent and lasting character. In consequence, the number of vouchers is much diminished, and while there has been a considerable increase in correspondence incidental to the explanation of new rules, yet under them, and because of the rendition of semi-annual returns instead of quarterly, and also to a considerable degree, because of the intelligent persistent work of the clerical force, the division has been enabled to make its satisfactory showing.

Upwards of 26,500 papers, including accounts-current, returns, vouchers, statements, letters, etc., have been handled during the year.

Capt. James Allen, Third Cavalry, Signal Officer, was in charge of the division during February and April, 1890; First Lieut. R. E. Thompson, Sixth Infantry, Signal Officer, during October, 1889, and May and June, 1890; Second Lieut. W. A. Glassford, Signal Corps, Signal Officer, during November and December, 1889, and January and March, 1890, and Second Lieut. Frank Greene, Signal Corps, Signal Officer, during July, August, and September, 1889.

Very respectfully,

R. E. THOMPSON,
First Lieutenant, Sixth Infantry, Signal Officer, Examiner.

The CHIEF SIGNAL OFFICER.

APPENDIX 22.

REPORT OF THE OFFICER IN CHARGE OF THE PACIFIC COAST DIVISION.

SIGNAL SERVICE,
San Francisco, Cal., July 21, 1890.

SIR: I have the honor to make the following report of the operations of the Pacific Coast Division during the year ending June 30, 1890.

The principal work of the division, that of making weather forecasts for the Pacific Coast States has been continued, forecasts having been made each morning and night, except on Sunday mornings, for the four districts of Oregon, Washington, northern California, and southern California.

Special forecasts have also been made and telegraphed daily during the rainy season to 28 points in Oregon, Washington, California, and Nevada. At all these places signal flags have been displayed, thus insuring a wide publication of the daily forecasts.

Special warnings of rain for the benefit of the raisin-growers were sent out during the raisin-drying season and were the means of saving large quantities of raisins from damage from the early rains, which during the past season were unusually heavy. These warnings were sent to the observers of this service at Los Angeles, San Diego, and Fresno and also to points in the raisin districts to which the telegraphing of the daily forecasts had been authorized. From these points the warnings were widely disseminated, being sent to all persons requesting them at their own expense. Past experience having shown that such warnings can be given with great accuracy and that they are of the greatest value to the raisin-growers, it is recommended that this office be authorized to send these warnings at the expense of this service to all points where a trustworthy person will agree to bulletin the messages received for the benefit of the general public. To a certain extent this has been done in the past; notice having been given that the daily forecasts would be telegraphed to any place where signal flags would be procured and displayed. This, however, has not fully met the wants of the raisin-growers, as, in southern California, during the raisin-drying season the occurrence of rain is so infrequent that many do not feel inclined to incur the trouble involved in the daily display of flags, who nevertheless would be glad to receive special warnings of rain.

The display of cautionary and storm signals at Eureka, ports at the mouth of the Columbia River and on Puget Sound has been continued during the year. Owing, however, to the fact that these cautionary signal stations are at isolated points off the main telegraph lines, and that the past season has been a notable one for its heavy rains resulting in frequent breaks in the telegraphic service to these points, the ordering of signals has been greatly interfered with.

Meteorological reports from about 30 voluntary observers have been received monthly and forwarded to the Chief Signal Officer for use in the compilation of the Monthly Weather Review and for file. On account of the many local peculiarities in the occurrence of frost and rain at stations on the Pacific coast, these reports would be of great aid in study and would enable greater accuracy to be obtained in the special forecasts sent to points at a distance from Signal Service stations, if some plan were devised whereby these reports could be left in the hands of the officer in charge of this division for a longer time than is now the case.

A weather summary accompanied by a rainfall table showing the monthly and seasonal rainfall at about 75 selected stations together with a comparison with the normal rainfall, has been issued at the beginning of each month except during midsummer. This summary has been compiled from the telegraphic reports received from Signal Service stations and those of the Southern Pacific Railway Company. A short table showing the meteorological conditions at 18 stations has been prepared each month for publication in the Occidental Medical Times.

The Point Reyes telegraph line has remained in charge of this office during the year. For only a little over 2 months has direct communication with Point Reyes been maintained. During the remainder of the year that portion of the line between Tiburon and Point Reyes has been kept up and the operator of the San Francisco and

North Pacific Railway Company employed to transfer all messages from Point Reyes to the lines of the Western Union Company.

The cable connecting Fort Mason and Alcatraz Island was raised and after being repaired was relaid August 21. The old abandoned cable between these two points had been recovered the month previous. On August 20 the cable between Angel and Alcatraz Islands was broken by a vessel's anchor and was repaired September 3. From this date to November 7 the line was maintained in its entirety. On that date the Fort Mason cable was again broken and direct communication with Point Reyes prevented.

Four hundred and fifty-six weather and vessel reports have been received from Point Reyes during the year and 113 vessels have been reported.

I am, sir, very respectfully, your obedient servant,

J. E. MAXFIELD,
Second Lieutenant, Signal Corps.

The CHIEF SIGNAL OFFICER,
U. S. Army, Washington, D. C.

APPENDIX 23.

MEMORANDUM ACCOMPANYING REPORT OF SERGEANT MORRILL ON PARIS EXPOSITION.

EXHIBIT.

The exhibit comprised a set of the publications of the service, a small display of instruments, and a set of original charts recently compiled from the eighteen years' observations taken in the United States and from the international observations, the reduction of which has been performed by the Signal Service.

The publications shown embraced 52 bound volumes, including the Annual Reports, Monthly Weather Reviews, Professional Papers, Signal Service Notes, and reports of Arctic Expeditions, together with minor publications. There were also included in the exhibit 3,000 copies of pamphlets, charts, and weather maps, which have been issued from time to time for the public benefit. The latter were distributed to interested parties during the progress of the Exposition, as illustrative of the work done by the Signal Service in giving to the public meteorological information.

The instrumental display included only the more distinctively American of our ordinary station instruments, no attempt being made to show instruments of fine and expensive workmanship. It consisted of the triple self-register with accompanying anemometer, wind-vane, and recording rain-guage, together with a mountain barometer. The wind-vane was a miniature one, designed to illustrate the contact apparatus employed. The rain-guage was of the form recently designed by Professor Marvin, of the service, and now in current use.

The charts comprised 41 sheets, forming two series, viz: (1) The International Series, consisting of normal storm tracks for January and July, mean annual temperature, mean annual rainfall, and normal barometer and wind direction for January and July, throughout the northern hemisphere; (2) the United States Series, embracing normal monthly rainfall for each month, annual rainfall, rain-wind charts for each month, snow on the ground at end of 1888, the total snowfall of January, 1889, average dates of first and last killing frosts, annual depth of evaporation, lowest minimum temperatures, highest maximum temperatures throughout the United States, chart showing distribution, nature, and number of stations connected with the United States Signal Service, chart showing location of regular Signal Service stations, and chart showing the telegraph circuits used in the transmission of weather reports. In addition to these were a set of mounted daily weather maps, showing the progress of the severe storm of January 6 to 10, 1886, with accompanying set of indication charts, and a similar set of charts illustrative of the March blizzard of 1888. It is to be regretted that the United States charts could not include the normal temperatures, owing to the state of the data.

INSTALLATION.

The United States Section of Liberal Arts, to which category this exhibit was assigned in accordance with the rulings of the French authorities, was installed in the gallery of the entrance hall on the Avenue Saffron side of the Champs de Mars. The Signal Service was allotted a space 3.5 metres in width by 2.5 metres in depth, facing directly on the passage way at the end of the gallery. To utilize as completely as possible this space, I had erected across the back and at the two sides a counter 0.7 metre wide, which was covered at the sides and on top with suitable cloth, and faced with an ebonized molding at top and bottom. The wall at the back was covered with the same cloth to a height of 3.5 metres above the counter, and surrounded by a similar molding. The wall space thus obtained was employed for the display of some of the more distinctive charts, the remainder being displayed on one of the side counters in portfolios. The opposite side was used for display of instruments, and the rear counter gave suitable space for the publications. The central space, 1.1 by 2.2 metres, was left open at the front and carpeted. The whole was upon a raised platform 0.2 metre in height. The installation, while necessarily inexpensive, was, on the whole, presentable, and compared favorably with adjacent exhibits. The entire United States section was somewhat deficient in finish and elegance.

FOREIGN METEOROLOGICAL EXHIBITS.

The display of meteorological matters in the Exposition was not large. No meteorological service other than our own made an individual display. There were several exhibits of apparatus by manufacturers, the best being that of Richard Freres. This firm showed their well-known forms of registering thermometers and hygrometers, sunshine recorders, anemographs, etc.

In new apparatus I noted especially an instrument for recording by a continuous curve the rapidity of electrical contacts and thus, by a suitable contact-maker upon the ordinary Robinson anemometer, enabling the registration of the velocity of the wind in the form of a continuous curve with ordinates proportional to the velocity at any instant of time. The mechanism by which this result was obtained was not obvious, but in general appearance the instrument resembled the tele-thermograph register made by the same firm and recently introduced in the Signal Service and the registration was upon a vertical cylinder as in that case. The instrument was employed at the Exposition to register the wind velocity at the top of the Tour Eiffel, some 2,000 feet distant, and seemed to work very successfully. The advantages of such a record of wind velocity over the movement by miles, which is registered by the Signal Service instrument, are plainly obvious and the instrument is worthy of consideration by the service. The same firm exhibited a spring seismograph, adapted to continuous registration upon the usual vertical cylinder. A strong curved spring firmly attached to the base supports a stout rod, upon which is a sliding weight. To a long pivoted arm carrying the pen is attached a short arm which rests loosely against the stout rod by the pressure of a light spring. Every oscillation of the rod causes a magnified motion of the pen and consequent departure from the normal straight line made upon the registering cylinder.

Near the exhibit of the Richard Bros. was an exhibit of thermometers, graduated tubes, pipettes, etc., by the noted maker Baudin, but containing nothing especially new or noteworthy.

In the Dutch Section was an exhibit by Olland of Utrecht, which contained an instrument for recording the force and direction of the wind, worthy of notice for its direction-register. This was so made as to distinguish without possible doubt the veering and backing of the wind. The wind vane carried with it a pressure plate made on Oster's principle and, rigidly attached to it, is a vertical rod which descends to the register. On the lower end of this rod is mounted the main drum. A second drum of the same size is mounted on a parallel axis removed from the first a distance equal to the circumference of the drum. An endless belt surrounds the two drums and is, from their position, in length, three times the circumference of either. Three siphon pens are hung on this belt at equal intervals. The registering cylinder turns on a horizontal axis parallel to one of the straight sides of the endless belt which carries the pens. The position of the wind-vane is recorded continuously and when the vane has revolved 360 degrees, a second pen takes the place of the one which has traveled the length of the register. From the inclination of the trace across the record-sheet, one sees at a glance whether the wind has backed or veered. The outer halves of the drums and the side of the belt remote from the registering cylinder are surrounded by a brass frame, which lifts the pen from the record-sheet at the end of its path and causes the next one to begin its record at the proper point. To register the force of the wind, a cord from the pressure-plate passes over pulleys and is attached to a carriage which runs on a track parallel to the registering cylinder. The carriage bears a siphon pen, which makes a trace on the record sheet, the displacement being proportional to the force of the wind. The time-spaces are marked upon the sheet by pens fixed to a sliding bar, parallel to the cylinder and moved in the direction of its length at the end of each hour. This method of recording the time adds nothing to the accuracy over that by a divided sheet as it is made by the same clock that drives the cylinder, but it would allow the use of a roll of paper for several days' record.

In the work of the Signal Service upon atmospheric electricity, recently brought to a close, the need was felt of some simple electrometer, which would give direct readings by a needle and scale. Such an instrument was shown by J. Carpenter in his exhibit of electrical apparatus in the Palais des Machines. The quadrants of the usual Mascart electrometer have been replaced by segments of an elongated cylinder and similar cylindrical segments but smaller have been placed inside and concentric with them. The needle, instead of being a thin pair of sectors connected by radial strips, is a segment of a cylinder intermediate in diameter between the outer and inner quadrantal segments. The oscillations of the needle are checked by placing the whole in the magnetic field between the poles of a horse-shoe magnet. By this arrangement the instrument is made nearly aperiodic and the range of motion is sufficient to allow readings on a circular scale by attached pointer. The axis of the needle is made either vertical or horizontal; in the former case the suspension is torsion and in the latter on knife edges.

In the Swiss Section the Geneva society, among their well-known measuring instruments, showed a cathetometer on the model designed by Professor Mendenhall for the use of the service. It was designated "The American Model." They also exhibited a dynamometer for tension tests, which would be convenient in the testing of telegraph wire. It consists of two pairs of wheels. One pair is attached by a rod to the spring dynamometer, and the other pair to a screw, which, working in a rotating nut in a small bevel-wheel, is moved by the action of a larger bevel-wheel, which is turned by a handle. The dynamometer is furnished with a dial, indicating to 250 pounds. In use, the wire to be tested is placed between the two pairs of wheels, being fastened to each pair by a thumb-screw and jaws. The whole forms a very compact machine for light testing, such as telegraph wire.

In the exhibit of the French minister of public instruction was shown a Mascart photographic register similar to that employed in my work in atmospheric electricity, but fitted for recording three curves synchronously on the same sheet. This was accomplished by placing in front of the slit of the register two vertical mirrors, one on each side and inclined at an angle of 45 degrees. The indicating instrument, in this case magnetic, provided with lamps and reflecting mirrors, was so placed that a ray of light falls directly on the central portion of the sensitive plate, while other rays are reflected by the fixed mirrors to fall one on each side of the plate. In the same exhibit was shown by the Observatory of Lyons an ingenious clock, or rather seconds' pendulum actuated solely by electricity. This might be useful in the laboratory, being designed to make and break an exterior circuit each second. In this case there is a permanent horseshoe magnet, through the poles of which run two rods, the latter held by blocks and adjustable by means of the screw-threads playing in them. An electro-magnet is pivoted below to a proper support so that its upper pole comes between the poles of the horseshoe magnet. From a bar attached to the base of the electro-magnet depends a curved piece, the latter hanging freely so as to allow the pendulum below to hang freely without strain upon the axis. Attached to the above curved piece is a flat spring, to the lower end of which is hung the pendulum proper by means of a pivot arrangement. About a foot from the upper end of the pendulum is attached the contact-making arrangement, described as follows:

A small permanent magnet is attached to the pendulum at the rear. Two horizontal bars of iron, serving as armatures to the poles of the permanent magnet, are attached to curved bars of brass, and pivoted on a fixed support near the pendulum rod when in its middle position. The outer ends of the curved bars of brass are provided with contact pins, closely above which are light springs firmly attached to stationary blocks. With each swing of the pendulum the respective poles of the horseshoe magnet are brought alternately above the corresponding iron armature. The latter is lifted but prevented from touching the magnet by appropriate stops. As the armature is lifted contact is made at the contact pins and spring. The circuit thus closed is so arranged as to alternately polarize the electro-magnet described above in opposite sense, and by the attraction and repulsion of the poles of the larger permanent magnet, also described above, impulses are given alternately in opposite directions through a spring to the pendulum. These impulses serve to overcome the resistance of the air and friction of the pivot, and thus the pendulum is kept in motion after being once started. The same contacts serve to complete each second the exterior circuit, which can be employed to control electric clocks or to register on a chronograph.

Many instruments other than those above described were of course exhibited, but mostly valuable as indicating the manufacturing facilities of the makers, or else well known in this country already, and not of special suggestiveness for the purposes of a practical meteorological service like our own

A brief notice of the central meteorological bureau of France may not be out of place in this connection, inasmuch as I there saw several ingenious pieces of apparatus. I found the French service housed in a rambling stone building, seemingly rather inconvenient. The library was small but valuable, and the laboratory facilities as poor as our own. Ascending to the top of a small square tower is found one instrument shelter, and a second is situated on the ground in the central garden. The shelter differs materially from that of the Signal Service; the top has two roofs, one a foot above the other, and the upper is made of sheet iron. The sides are a single lattice, except toward the north, the northern side being covered only by wire netting with meshes an inch square; the bottom was entirely open. The roof shelter looked directly down upon a tinned roof a few feet below, from which the radiation must be excessive upon a hot day.

A registering rain gauge was in use, of simple construction, made as follows:

From the gauge a small pipe descends through the roof to a tank of about half the sectional area of the gauge. A float in the tank depends by a cord from the recording pen of a Richard register, the weight upon the pen lever being sustained by a light spring. As the float rises from the influx of water from the gauge the trace of the pen rises, the ordinate of the curve at any point being proportional to the total rainfall since the start, the rate of fall at any given time being indicated by the inclination of the tangent to the trace. For recording the velocity of the wind, the new instrument of Richard Freres, already described, was in use. For the direction of the wind a registering cylinder revolving with the wind vane was employed, the tracing pen moving vertically. An interesting instrument was an aspirator for registering the force of the wind, as follows: An iron tube ending in a blunt point with small opening was extended several feet above the roof. From the bottom of this a flexible tube descended to the top of a closed cylinder, partly filled with oil. This cylinder was connected by a tube to a similar open cylinder, the two forming a sort of U-tube device, the oil partly filling both cylinders. A float in one depends by a cord from the registering pen through the intervention of two curved bars arranged to roll upon each other. The float is attached to the lower bar, which is pivoted at one side and is pressed upward by a spring. A counterpoise allows of adjustment and keeps the upper curved bar in contact with the lower. The pen and registering cylinder are of the usual Richard type. The wind blowing across the open end of the exposed tube causes a diminuation of the pressure in the cylinder, and the oil flows from one to the other, thereby changing its level and lowering the float. By the intervention of the two curved bars the motion of the pen for light winds is made relatively greater than for heavier ones, and the record is thus made legible while still covering a sufficient range. The equipment for establishing a standard of thermometry and comparing thermometers was good, while in no sense novel. The standard barometer of the French service is a tube of large bore, drawn to a small opening at the base, and descends into a large open mercury tank. A curious method of determining the temperature of the column has been adopted. A thermometer is placed in a short open tube of mercury, which is placed at the middle height of the barometer column and some inches away. To determine the height of the column, a steel bar some 5 inches in length and pointed at both ends is so adjusted that its lower extremity touches the surface of the mercury in the tank, and the distance from its upper end to the top of the column is measured by a cathetometer placed a few feet distant.

AWARDS.

The estimation in which the Signal Service is held abroad is well shown by the award of a grand prize in each of the three classes in which it was entitled to entry, and in reality a fourth grand prize in that awarded the War Department for the Lady Franklin Bay Expedition. This bestowal of the highest possible approval upon the service by three separate bodies of judges, not merely French, but international in composition, bespeaks its high reputation abroad. Special thanks are due to the American members of the three juries of award which passed upon the merits of the Signal Service, Mr. Somerville P. Tuck, Mr. George W. Hayes, and Mr. A. L. Rotch, for the kindly interest they manifested in presenting its work and record to their respective juries.

It was my happiness to secure the presentation of the name of Prof. Cleveland Abbe by the Commissioner of the United States as one to receive the diploma of officer of the academy in recognition of his life-long services to meteorological science. This well-merited mark of esteem has been bestowed by the French Government.

Respectfully submitted to the Chief Signal Officer,

PARK MORRILL,
Sergeant, Signal Corps.

BOSTON, MASS., *May* 15, 1890.

APPENDIX 24.

RELATION OF DEW-POINT TO RAIN FORECASTS,

By Capt. JAMES ALLEN, *Signal Officer.*

SIGNAL OFFICE, WAR DEPARTMENT,
Washington City, June 30, 1890.

SIR: I have studied during the year the relations of the energy of the surface air, as represented by the total quantity of heat it contained, to the movement of storm centers and the extent of accompanying rain areas. The energy may be computed as follows:

Supposing the air to have been originally at 32° (and that its volume has remained constant) and the moisture in it water at 32°, the total quantity of heat applied to reduce to the state of observation will be:

$$A=\frac{(t-32)}{6}+Q$$

In which A is total heat per unit volume; t the temperature of the air; Q the total heat of vapor; the specific heat of air at constant volume being taken as one-sixth (.168).

From Regnault's formula we have—

$$Q=1091.7+.305\ (t-32).$$

If A is estimated in pound-degrees Fahrenheit the mechanical equivalent will be AJ=772 A foot pounds.

If we divide AJ by the pressure estimated in pounds per square foot it will give the height through which the pressure can be lifted, if all the heat is spent in work by expanding the air. An approximate expression for the upward velocity may be obtained from Torrecelli's theorem, from which we have $V^2=2gh$, "h" in this case being the height through which the pressure could be lifted if all the heat were spent in work. The theory has been that the storm center will move towards that point where V is the greatest. This may not be at the point of the surface where the estimated energy is the greatest, as, however great an amount of energy is available, there must be a difference of potential in order that it may be transmuted and work performed. The difference of potential is a function of the vertical decrement of temperature. This may be assumed to be the same for the same latitudes, or calculated from a mean of previous observations, or obtained from such tables as are available. As the numbers giving the total number of heat units are directly proportional to units of energy, they may, for a relative measure, be used directly.

For instance, a cubic foot of air, at 29 inches pressure, temperature 60° F. and dew-point 60°, contains 509.2 grains of dry air and 5.8 grains of vapor of water.

From the equation $A=\frac{(t-32)}{6}+Q$

we have for the dry air $\frac{509.2}{6}(60-32)=\frac{509.2}{6}\times28=2376$

and for the moist air from

$$Q=1091.7+305\ (t-32)$$

we have $1091+(.305\times28)=1100.2$

This, multiplied by 5.8, is equal to 6380.

We have then

For the dry air......	2376 grain degrees.
For the moisture....	6380
(A) Total.....	8756

From this it will be seen that in this case the energy contained in the moisture is nearly three times as great as that in the dry air. A greater portion of this total heat of vapor is latent heat. If λ represent the latent heat of vapor at temperature t; since $(t-32)$ units of heat are required to raise the water from 32° to t—, and $Q=\lambda+(t-32)$

$$\lambda = Q-(t-32) = 1091.7 - .695\,(t-32).$$

In the case given above $(1091.7 - .695 \times 28)\ 5.8$ gives 6213 grain degrees of latent heat.

It will also be observed from the above equation latent heat varies in an opposite direction to temperature.

From all of the above it is apparent that the greater part of the power that creates and moves a storm is that represented by the heat of the vapor of water in the atmosphere. The absolute amount of vapor in the air is indicated by the dew-point, and this may be taken as an approximate measure of the heat units or energy. As the heat in the dry air and a small portion of the heat in the moisture is sensible heat, and may be lost by radiation to any surrounding medium lower than its own temperature, while the latent heat of the moisture can only become sensible as the temperature continually falls, we see that this latent heat is really the effective force in storms.

Assuming that the dew-point gives an approximate relative value for this force, a tentative application of the theory was made during the months on which I was on forecast duty, with such encouraging results that it is believed that with further elaboration it will furnish an accurate and practical means of determining the storm track and rain areas. It was found that the rise in dew-point was generally in advance of the cloudiness, and thus giving 12 hours earlier an indication of the probable rain area. The direction of the movement and velocity of the storm center was, in well-developed storms, given very approximately and in some cases with remarkable accuracy. It was specially so in the great storm of March 25 to 29, 1890.

A map appended shows the path of the center of this storm, the lowest isobars at each observation, and also the actual dew-point and plus change in dew-point at the several observations. The night map of the 24th showed the highest dew-point on the North Pacific coast at Fort Canby, with a rise of 10° in the last 12 hours. The next morning the center was near this point. In attempting to determine the movement of the center for the next 12 hours two indications were found: one at Spokane Falls, with a dew-point of 34° and a rise of 14°; the other at Winnemucca, with a dew-point of 30° and a rise of 8°. The succeeding map showed a center at each place, separated by a low ridge of higher pressure. The p. m. map of the 25th showed a rise of 12° at Fort Custer, Mont., and 18° at Montrose, Colo. That the conditions at these places had each its own effect on the movement of the storm may be seen from the shape of the isobars on the morning of the 26th, when the next to the lowest isobar forms one loop to include Fort Custer and another extending towards Montrose. If we draw lines from the centers at Spokane Falls and Winnemucca to the centers of development at Fort Custer and Montrose, and on each set of lines construct a parallelogram of forces, we will find that the diagonals will intersect in eastern Idaho and nearly within the lowest isobar found on the map the next morning. From this time on the problem is much more simple, as there appears on each map a single and marked evidence of a center of development in advance of the storm center: on the morning of the 26th it is at Denver, where the dew-point was 22° and the rise 32° in 12 hours, and on the night of the 26th it is at Wichita, with a dew-point of 52° and a rise of 36°. The points for the succeeding days are indicated on the map; and it will be seen that these indications were correct, both as so the time and place. The storm center in each case at the end of 12 hours being found within the line drawn around the one, two, or three stations having the highest dew-point and the greatest rise in last 12 hours.

The conclusions to be drawn from a given dew-point or its change in 12 or 24 hours, are quite different for different localities, and for seasons widely apart.

The maps appended will show, for the various stations, the highest dew-point not followed by rain in the next 24 hours, and the greatest plus change in dew-point not followed by rain in 24 hours, for July and December.

An examination of these maps will give an idea of the value to be given to changes in different localities. It was also noted that while the storm centre had a marked tendency to the highest dew-point its position at the end of 12 hours was often in a direction from that station indicated by the wind arrow and at a distance corresponding to the wind velocity, the center of development being apparently carried along by the wind, showing that to the potential energy of the vapor must be added a factor representing the kinetic energy possessed by the air.

The basis of the solution of this complex dynamic problem is in determining and charting in some simple manner the energy possessed by the air both kinetic and potential and differences of potential. To do this a series of special observations must be made to determine more fully the vertical distribution of temperature and moisture under varied conditions. Many observations have already been made that can be utilized. A quantitative determination even if in very large error will undoubtedly give excellent results; for the energy possessed by any well defined storm is so enormous that small errors will not be appreciable. To give some idea of the irresistible force of a storm the following is quoted from "Les Phenomenes L'Atmosphere" par H. Mohn:

"MECHANICAL WORK OF A HURRICANE.

"The sum of the living forces contained in an intertropical hurricane and the enormous and complex work which is necessary to set the air in motion, to give rise to waves and to produce all the destructive effects of this sort of storms is very great.

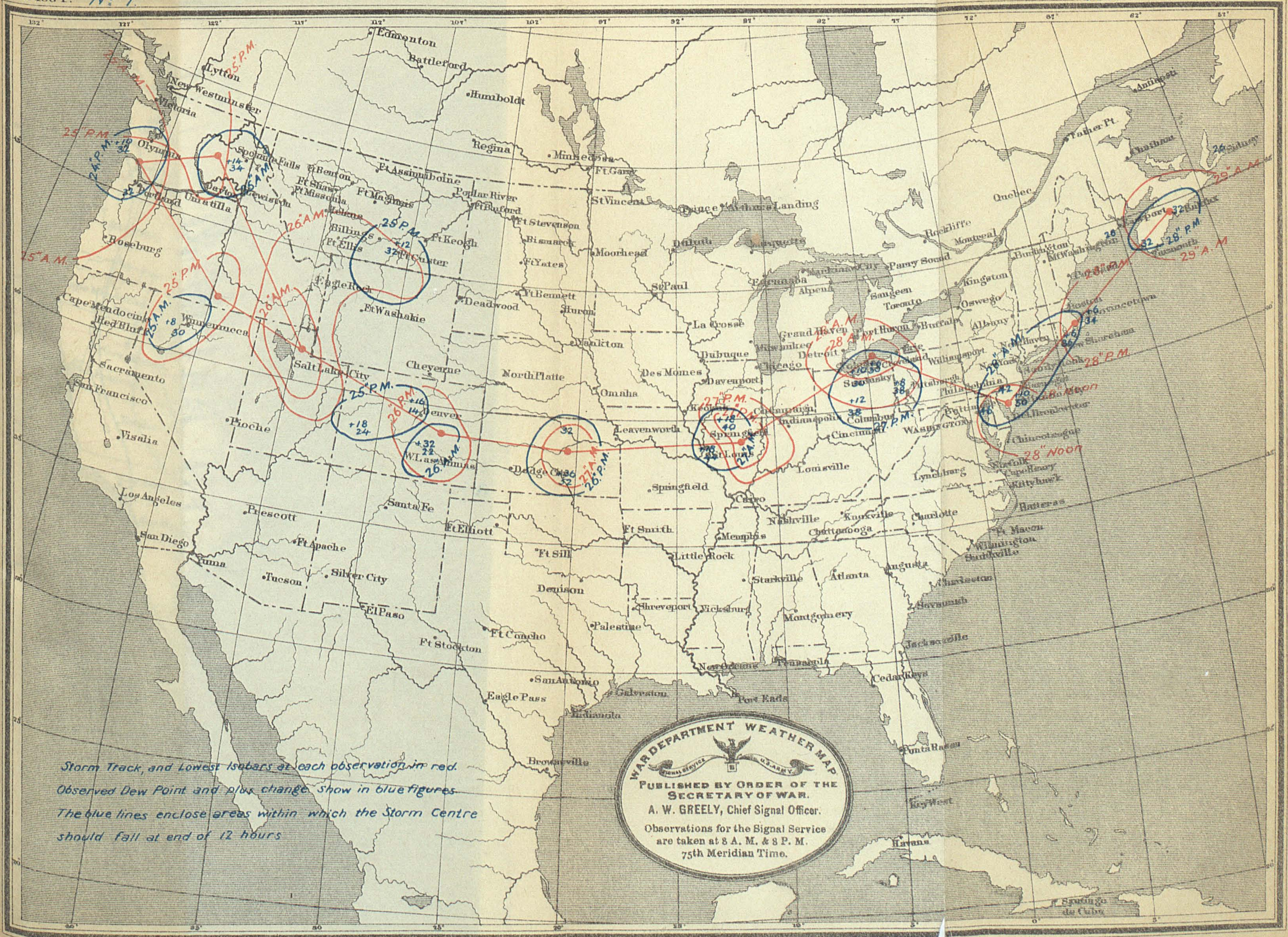
"The hurricane which passed over the Island of Cuba on the morning of October 5th, 1844, pursued its path towards the northeast and outside of the eastern coast of the United States, and arrived at New Foundland the evening of October 7th. In the mean, the direction of the wind in this hurricane formed an angle of 84° with the gradient, and consequently did not deviate more than 6° (towards the centre) from a completely circular movement about the centre of the vortex.

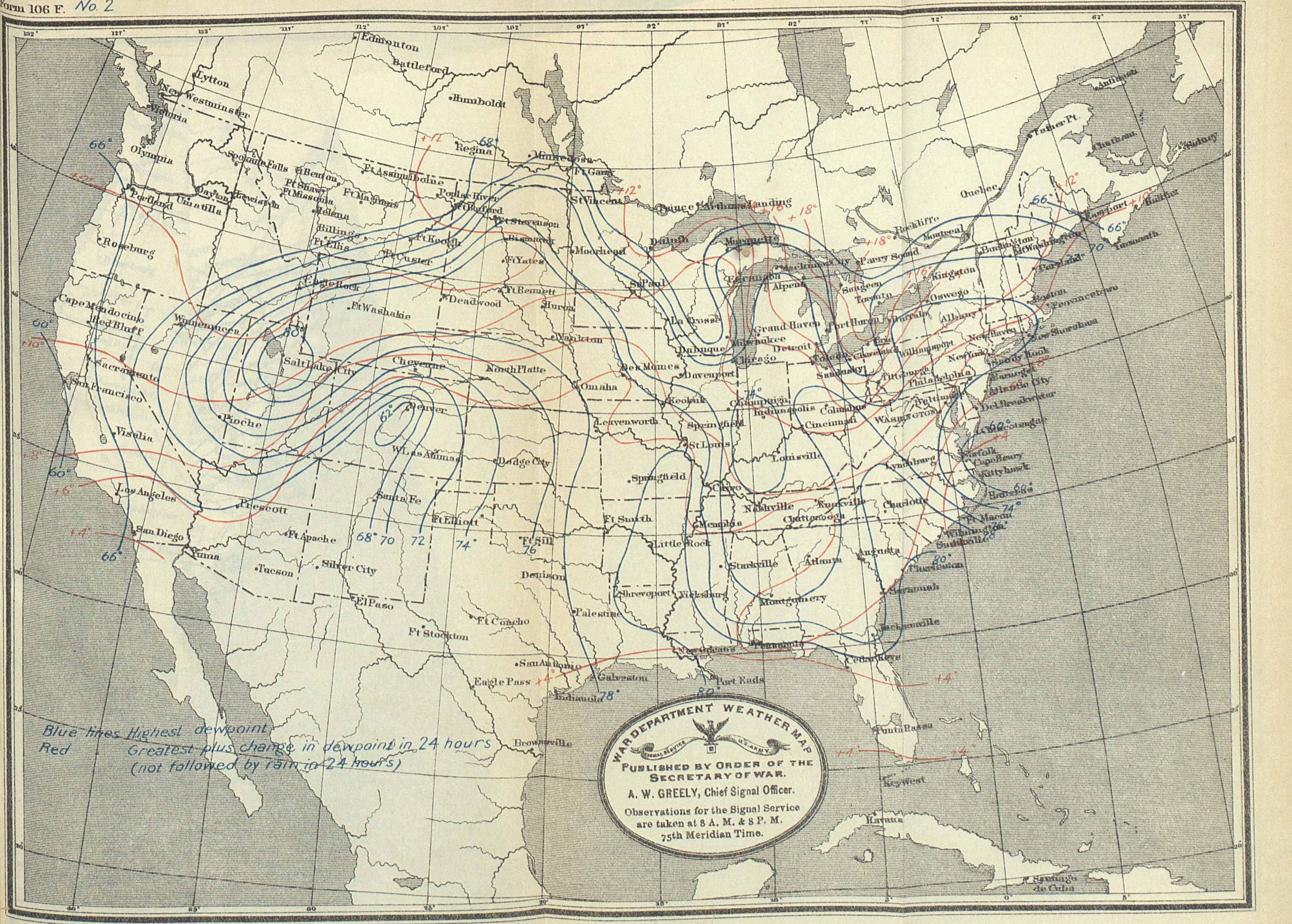
"The velocity of the wind, however, was so great that if one assumes that about its centre was a cylinder 100 metres high and of 20 geographical miles radius at the base, the flow would not be less than 420.5 millions of cubic metres per second. This storm-cylinder would not need more than five hours and nineteen minutes to fill itself up again with new air, and a mass of air of this dimension weighs approximately 490 million hundred-weight. This mass of air would take three days and probably a little more to move from the exterior to the centre of the storm. The air in the cylinder consequently renewed itself more than 13 times during the days of October 5th, 6th and 7th, 1844. If we now suppose that the exterior air had at first on the edge of the cyclone a velocity of 6 geographical miles per hour or from 12 to 13 metres per second, we will find that the hurricane of Cuba, simply in order to put in motion the inflowing air, which lasted during the three days mentioned above, had employed a force of at least 473.5 millions horsepower, that is to say, at least 15 *times that which, in the same space of time, is produced by all the wind mills, all the turbines and all the steam engines and all the men and animals that exist on the surface of the globe.* Whence comes this colossal force? From the latent heat of vapor which rises at the centre of the hurricane and is there condensed. If a rainfall of 1mm. fell in one day on a circular surface of 20 geographical miles, the condensation of the vapor necessary for the precipitation of this quantity of rain would liberate a quantity of heat six times greater than that which, converted into work, corresponds to the manifestations of the force of the hurricane at the earth's surface and there always remains more force than is necessary to produce the ascending movements. A quantity of rain of 1 mm. per day on a circular surface of 8 geographical miles would be sufficient to produce, by the liberation of the latent heat of its vapor, the force which was liberated in the hurricane of Cuba within the air-cylinder of which we have spoken above."

Very respectfully,

JAMES ALLEN,
Captain Third Cavalry, S. O., Assistant.

The CHIEF SIGNAL OFFICER.


Storm Track, and Lowest Isobars at each observation in red.
Observed Dew Point and plus change shown in blue figures.
The blue lines enclose areas within which the Storm Centre should fall at end of 12 hours
WAR DEPARTMENT WEATHER MAP
SIGNAL SERVICE U.S. ARMY
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
A. W. GREELY, Chief Signal Officer.
Observations for the Signal Service are taken at 8 A. M. & 8 P. M. 75th Meridian Time.


Blue lines Highest dewpoint
Red " Greatest plus change in dewpoint in 24 hours
(not followed by rain in 24 hours)
WAR DEPARTMENT WEATHER MAP
SIGNAL SERVICE
U.S. ARMY
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
A. W. GREELY, Chief Signal Officer.
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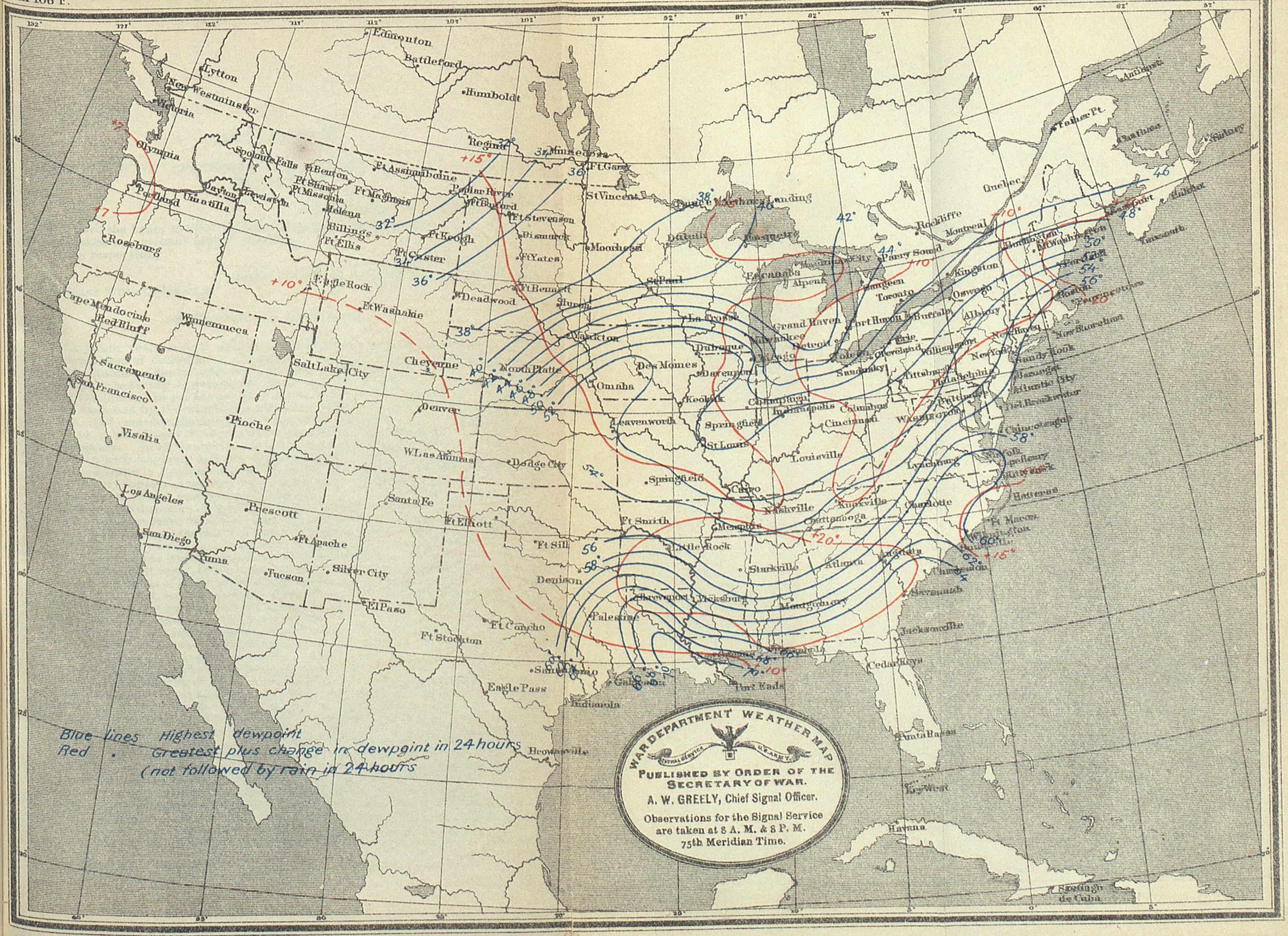
Blue lines Highest dewpoint
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(not followed by rain in 24 hours
WAR DEPARTMENT WEATHER MAP
SIGNAL SERVICE U.S. ARMY
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
A. W. GREELY, Chief Signal Officer.
Observations for the Signal Service are taken at 8 A. M. & 8 P. M. 75th Meridian Time.

APPENDIX 25.

REPORT ON WIND PRESSURES AND THE MEASUREMENT OF WIND VELOCITIES.

WASHINGTON, D. C., *October* 14, 1890.

SIR: I have the honor to submit the accompanying report of results of experimental research taken up pursuant to your direction.

Very respectfully,

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MEASUREMENT OF WIND VELOCITIES.

Within recent years several different experimenters have independently worked upon the problem of determining the relations between the rate of rotation of the cups of the Robinson anemometer and the velocity of the wind.

The most noteworthy experiments* have, without exception, been made upon whirling machines. In earlier experiments so many errors have arisen, due to the influence exercised by the whirling machine in stirring up and setting the air itself in motion, that considerable uncertainty exists in respect to results thus obtained. To avoid or at least lessen these errors it is necessary to use whirling machines of very large dimensions. In 1888 experiments with such apparatus were begun at about the same time in both England and the United States. The machine used by Messrs. Whipple and Dines in England was set up in the open air, and is still in use in carrying on in a very ingenious manner experiments upon wind pressures. The length of the whirling arm in this case was about 29 feet. In the experiments made in this country under the direction of the Chief Signal Officer, and which were carried out under circumstances more favorable than any yet obtained, the arm of the whirling machine was 35 feet long for many of the experiments and for others was shortened to 28 feet. This very large apparatus was placed in a completely closed court of large dimensions, and at the time of experimentation no air currents except those produced by the machine itself could be detected by the most delicate indicators. In these experiments the effects of currents set up by the motion of the whirling machine itself were very small, but were accurately determined by a new method, which it is believed gives the best results thus far obtained. A brief explanation may make the circumstances more clear. As the large whirler with the anemometer is made to revolve, the air immediately surrounding it is pushed or dragged along with the arm to a certain extent, so that the actual movement of the anemometer through the air is somewhat less than the apparent movement. This actual movement was measured by placing a special very small and delicate anemometer in front of the anemometer being tested and observing on the former the actual velocity of rotation of the arm. The constants of the delicate anemometer are, for this purpose, previously determined with great accuracy, a result easily obtained, as the small size of the anemometer not only admits of its being carried by a slender support at a distance of several feet from the whirling arm and entirely beyond the influence of disturbances produced by the arm, but the very rapid rate of revolution of the cups enables accurate measurements to be made in a very short time and with only one or two revolutions of the large whirler. A more complete discussion of the methods used and results obtained have been given in the Signal Service monthly weather review for February, 1889.

Subsequent to the experiments upon the whirling machine an extended study has been made of the comparison of different anemometers when similarly exposed in the open air. Very early in this study I was led to the belief that the very sudden and continuous changes of considerable magnitude in the velocity of ordinary winds led to a noticeably different action of the anemometer than would result from the influ-

* Robinson, Phil. Trans., CLXIX, 1878, 777–822; Stokes, Proc. Roy. Soc., XXXII, 1881, 170–188; Dohrandt, Rep. für Met., band VI, No. 5.

ence of steady currents. So far as I am aware this important element has not thus far been considered either in the development of a mathematical theory for the anemometer or in the final reduction of experimental results. Some mention and discussion of the subject first appeared in the American Meteorological Journal of April, 1889.

As the matter only came to my attention after the experiments with the whirling apparatus were completed, it was impossible to make it a subject of direct experiment, but it is hoped to be able shortly to again take up the whirling-machine work, in anticipation of which a new line of experiment bearing directly upon this subject has been devised. The condition which it is necessary to secure is to propel the anemometer through still air with a highly and constantly varying velocity, for which purpose the whirling arm will be arranged with an independently revolving plate, or reciprocating lever, at the outer end, the resultant motion of which combination will have the desired irregular character. The *anemometer comparisons* comprised a comparison in the open air of several Robinson anemometers of different dimensions, the constants of each being known from the whirling-machine experiments. Previous studies had shown that the velocities indicated by the different instruments, when exposed to the same wind, were not the same, and the object of the investigation was to ascertain the true velocity and determine the proper formula for the Signal Service anemometers.

The results have been discussed at some length in the monthly weather review for January, 1890. With accurate whirling-machine experiments as the basis of comparison, the conclusion reached is to the effect that, *of anemometers exposed to the same wind, those whose cups and arms are of slender proportions indicate a higher velocity than that shown by anemometers whose cups and arms are of compact proportions.* The terms slender and compact, in this connection, refer to the relation existing between the diameter of the cups and the length of the arms. Anemometers whose arms from the axis to the centres of the cups are nearly two or more times the diameter of the cups are considered as being of slender proportions, while those whose arms have a length only a little greater or even less than the diameter of the cups are said to be of compact proportions. It is believed this result is brought about by the gusty and violently fluctuating character of open-air winds.

In the absence of whirling-machine experiments with highly variable velocities, as referred to above, the open air comparisons were reduced upon the basis that such sudden variations in wind velocities produce a less influence upon anemometers of compact proportion than upon those of slender proportions.

The formulæ derived for the Signal Service anemometer having cups 4 inches in diameter on arms 6.72 inches long are:

$$(a)\ V = .225 + 3.143v - .0362v^2 \text{ (whirling machine).}$$
$$(b)\ V = .265 + 2.953v - .0407v^2,\ (a) \text{ reduced to open air.}$$

V is velocity of wind in miles per hour; *v* is velocity centers of cups in miles per hour.

Equation (*b*) may be considered as the equation of the Signal Service anemometer when exposed to the variable winds of the open air, while equation (*a*) is for the same anemometer exposed to perfectly steady winds. Quadratic equations of this form have been used by several investigators for expressing the anemometer law. They are quite irrational however, and wholly inadequate.

In equation (*b*) V becomes a maximum for $v = \frac{2.953}{.0814}$, the interpretation of which leads to the irrational conclusion that after a certain high velocity the cups run less and less rapidly as the wind increases.

It should be noted, of course, that the constants in these equations have been computed from results at low velocities; that is, under 35 miles per hour.

Recognizing this defect of the quadratic equation, it was desired to secure a formula giving a more satisfactory extension beyond the limits of the experiments, and an equation of the following form was computed:

$$(c)\ \log.\ V = .509 + .9012 \log.\ v.$$

This equation is recommended for use in reducing all wind velocities observed by the Signal Service anemometer, and certain checks that have been recently obtained from wind-pressure experiments, as given below, have shown the equation to be highly satisfactory.

Inasmuch as the Robinson anemometer is always constructed so that the graduations of the dials are in miles and fractions of miles, computed on the basis that the cup centers move with a velocity one-third that of the wind, the most convenient method of applying the above formula is by use of a table containing the observed velocity by the Robinson formula and the more accurate velocity from the logarithmic formula.

The following is such a table:

TABLE 1.—CORRECTED WIND VELOCITIES AS INDICATED BY ROBINSON ANEMOMETER.

[Miles per hour.]

Indicated velocity.	0	1	2	3	4	5	6	7	8	9
0	......	......	......	......	......	5.1	6.0	6.9	7.8	8.7
1	9.6	10.4	11.3	12.1	12.9	13.8	14.6	15.4	16.2	17.0
2	17.8	18.6	19.4	20.2	21.0	21.8	22.6	23.4	24.2	24.9
3	25.7	26.5	27.3	28.0	28.8	29.6	30.3	31.1	31.8	32.6
4	33.3	34.1	34.8	35.6	36.3	37.1	37.8	38.5	39.3	40.0
5	40.8	41.5	42.2	43.0	43.7	44.4	45.1	45.9	46.6	47.3
6	48.0	48.7	49.4	50.2	50.9	51.6	52.3	53.0	53.8	54.5
7	55.2	55.9	56.6	57.3	58.0	58.7	59.4	60.1	60.8	61.5
8	62.2	62.9	63.6	64.3	65.0	65.8	66.4	67.1	67.8	68.5
9	69.2	......	......	......	......	......	......	......	......	......

All observers in the United States using anemometers similar in construction to those of the Signal Service will find the values in the above table much more accurate than those commonly used.

Several day's continuous comparisons of anemometers of different sizes were also obtained at the summit of Mount Washington under reduced atmospheric pressure and at unusual velocities; the exposure being upon the top of the wind-pressure apparatus to be described below.

Three anemometers, each having 4-inch cups, but with arms 4, 6.7, and 7 inches long, respectively, were compared; very high velocities being obtained on one occasion, so much so, in fact, as to carry away the anemometers, all three being torn from the support at apparently the same instant, the mean indicated velocity just previous being about 80 miles per hour.

The results of these comparisons have agreed almost perfectly with the more extended and complete comparisons referred to above, though the former were over a much less range of velocity. So far as these comparisons go I find no evidence that the Robinson anemometer is noticeably influenced by considerable changes in the atmospheric pressure. There is little reason, however, to expect that such effects, did any exist, would be apparent in comparisons of this kind.

WIND PRESSURES.

Even at the present time of advanced experimental study of natural phenomena, our knowledge of the relation of wind pressure and velocity is very limited and incomplete. The most serious and perplexing disturbances appear to accompany investigations in this direction, and accurate results have, perhaps, never been obtained. The last accounts of the experiments of Messrs. Whipple and Dines have just appeared in the September number of the Proceedings of the Royal Society. Notwithstanding the care exercised in conducting the experiments, the results in some respects are irregular and inexplicable. The method used is only practicable on the basis that the pressures vary as the square of the velocity, and the success of the experiments, so far as the method is concerned, leaves no doubt on this question. The experiments made by Mr. Crosby, and given in the Engineering News for the latter part of June, indicated a linear law which must undoubtedly prove to be quite incorrect.

A number of direct determinations of the wind pressure upon large plates were made at the summit of Mount Washington during the summer.

Before discussing the special experiments and results obtained I wish to remark briefly upon the problem in general, and present a few ideas that may be of value in case the subject is given further study in the future.

In such an investigation as this it is necessary to measure but two elements, namely, the wind pressure and the wind velocity. The accurate measure of the wind velocity had already been the subject of considerable study, as discussed above. I mention this matter here from the fact that the conclusions expressed there have, in my opinion, received an important confirmation in the results of the wind pressure experiments.

In the problem in hand, therefore, I have used for the measurement of the wind velocity the regular Robinson anemometer, applying to its indications the system of corrections determined by the studies already referred to.

A great number of schemes for observing and measuring the wind pressure presented themselves to me, but the very limited time available not only for the preparation of the apparatus, which all required to be made anew, but also for the performance of the experiments, proved a very great restriction upon what could be undertaken. After several fruitless efforts to make satisfactory arrangements with the more reliable instrument makers for the construction of the special apparatus needed, I was obliged to undertake its preparation in the machine shop connected with the instrument division of this office, though the latter is provided with only the most ordinary of facilities. It was, therefore, necessary to restrict the instruments to their most simple form, and some kinds of experiments that I at first wished to make could not be undertaken.

It is important further to consider the nature of the conditions under which it was necessary to make the experiments. The extreme and continual variations in the velocity of the wind movement in the open air has been repeatedly referred to in the anemometer experiments and forms an important element not previously considered in the theory of the measurement of wind velocity. So, also, in wind-pressure experiments, these violent fluctuations not only, in my opinion, have a direct influence on the pressure exerted, but offer a serious difficulty in the way of the instrumental measurement of the actual pressure. Again, the direction of the wind is nearly, or quite, as variable as the velocity, an additional obstacle in the way of instrumentation Moreover, as might readily be supposed, the wind movement at such a place as Mount Washington was not along a horizontal line but possessed a noticeable inclination upward. These various elements were considered and provided for as fully as possible in the preparation of the instruments.

Finally, it unfortunately occurs that the mountain on those occasions otherwise favorable for experiments is often enveloped in dense fog that drives with the wind and penetrates to every part of the apparatus, being very troublesome in connection with the operation of more or less delicate self-recording mechanisms.

In such a study as this of the variation of the wind pressure with the extent of surface and with the velocity of the wind, it is believed important information can be gained by use of what may be called a shielded plate. Here the pressure plate is actually only a small portion of a much larger plate and moves within an opening through the latter. This arrangement avoids the effects that arise from the flow of the air around the edges of the plate and which modify possibly the relations of pressure with plate area. Such a condition was found very difficult to properly secure in the style of apparatus used, and was not attempted.

Further information is to be gained, not by the direct measurement of the pressure on a plate but by studying its distribution over the surface from all points of the edge to the center. This would require very delicate apparatus, and the subject was given considerable attention after it occurred to me that a modification of the aneroid barometer could be made to serve in an admirable manner for such investigations. For this purpose the outlet tube of the aneroid disc is opened and attached to flexible tubing leading to the surface of the plate. With suitably prepared devices the excess or deficiency of the air pressure next the surface of the plate either front or back and at any point could be readily ascertained. This, in connection with direction of the air currents at the corresponding points would enable one to make a very complete chart of the action of the wind on the plate. The best device for determining the direction of the air currents consists of a small light cord or thread tied by one end to a slender rod.

The earlier experiments made at Mount Washington were preliminary in many respects and indicated the arrangement of apparatus best suited to the various conditions.

The apparatus was exposed upon the top of a solidly built wooden tower about 40 feet high and some 15 feet square at the top. This occupied the highest point of the mountain and afforded an unobstructed exposure for all winds from westerly and northerly directions. Southerly winds were somewhat interfered with by the presence of a low building in that direction, and the exposure for easterly winds was very bad owing to the proximity of the large hotel building. Only a very few experiments were made with southerly winds; the direction being westerly for all other experiments. No defect attributable to imperfect or unequal exposure has been discovered in the results. The diagonals of the tower were north and south and east and west, respectively. The apparatus occupied the westerly corner and was so constructed that the plate was held in front of the sides of the tower by a distance of nearly 4 feet. The center of the plate was, moreover, a distance of nearly 6 feet above the floor of the tower.

The apparatus itself may be briefly described as consisting of a rigid vertical support of wrought-iron pipe secured to the floor and held firmly in the corner of the railing about the tower. The anemometer was attached to a horizontal arm extending from the top of the support. The arm was adjusted to the direction of the wind and carried the anemometer in about the same vertical plane as the pressure plate, so that the wind arrived at the two at practically the same instant. The anemometer cups were about 4 feet higher than the center of the pressure plate.

The horizontal arm carrying the pressure plate consisted of a wrought-iron pipe secured to the main support in such a manner that it could be revolved on a vertical axis and brought into the direction of the wind. The pressure plate was not attached directly to this arm but to a larger tube of brass, which telescoped over the iron pipe. A nicely arranged system of highly polished steel balls was provided that permitted the brass tube and pressure plate to move horizontally over the iron tube with the greatest freedom. Steel springs of varying strengths arranged to be stretched by the wind pressure were used to oppose the motion of the plate. At the rear, some 5 feet behind the pressure plate and attached to the main support, was the recording mechanisms arranged on the ordinary chronograph principles. A sliding pencil was connected directly to an extension from the pressure plate tube and recorded the amount of distension of the spring, the zero position being constantly indicated by a line traced by a stationary pencil. A third pencil operated by an electro-magnet was in electrical connection with the anemometer, which as before stated, was of the regular Signal Service pattern and one that had been carefully studied in connection with anemometer experiments. The electrical contacts of this anemometer were made for each 50 revolutions of the cups, a quantity that corresponds to one-tenth mile of wind movement, as computed by the *Robinson formula*. The chronograph cylinder revolved once in about a half hour, and was of such diameter as to give a movement of about 0.6 inch per minute.

In arranging this apparatus it was found almost impossible to automatically keep the large pressure plate with its accessories directed to the wind, so that it was necessary to secure this condition by hand and eye observation; the direction being indicated by a light cotton thread exposed above the pressure plate. I am assured that no sensible error arises from this disposition of the apparatus, as the direction of the wind, broadly considered, was very constant, being subject only to small and sudden fluctuations about a mean direction.

The records of the pressure and velocity of the wind were, therefore, automatically and simultaneously recorded on the same sheet of paper. The curve of pressures, if it can be called a curve, presents, in spite of the comparatively rapid rate of rotation of the register, a very irregular appearance indeed. The oscillations do not, except for occasional instants, correspond to harmonic vibrations of the spring and pressure plate as a vibratory system, but are actual and real changes in wind pressure. The magnitude of these variations is, itself, very irregular, but it may be stated to be approximately as much as 35 per cent. of the mean pressure. There is, in addition to these very rapid variations in the pressure which take place inside of a second or two of time, other variations which go through their irregular changes in from a few to several minutes time.

These circumstances led me to the following method of reducing the observations. The traces on the record sheets were divided into portions representing, generally, 4 or 5 minutes of time, and during which the conditions were, to some extent, constant. The traces of the pressure were all gone over by hand and a red-ink line drawn through the pencil mark in such a manner as to get a mean curve. In this, only those variations which were of such short period that the pencil marks were too close together to distinguish were evened up. All changes of larger periods were followed accurately. The next step consisted in carefully measuring the area of each subdivision, including, of course, everything between the red-ink trace and the line of zero pressure. This measurement was very satisfactorily made by a small planimeter. The mean pressure is now quite accurately found by dividing the area by the length of the base of the diagram. The mean wind velocity corresponding to the same portion of the sheet is determined from the simultaneous record of the anemometer. The large number of observations obtained in this way have been grouped in sets corresponding to the velocity and a final mean determined.

The following tables contain these results for all the experiments made:

SUMMARY OF WIND PRESSURES.

[Area of plate, 9 square feet.]

Velocity in miles per hour. *a* Robinson.	*b* Quadratic.	*c* Logarithmic.	Total pressure, pounds.	Constants, $\frac{P}{V^2}$. *a*	*b*	*c*	Constants, per square foot.	Mean barometer.
7.14	7.06	7.07	1.23	.0241	.0247	.0246	....	....
9.26	9.00	8.97	2.22	.0259	.0275	.0276	....	....
10.9	10.5	10.3	2.87	.0242	.0261	.0271	....	....
12.9	12.2	12.0	3.81	.0230	.0256	.0265	....	....
14.6	13.7	13.4	4.67	.0219	.0248	.0260	....	....
17.0	15.7	15.4	6.25	.0216	.0254	.0264	....	....
18.9	17.2	17.0	7.32	.0205	.0247	.0253	....	....
20.3	18.4	18.1	8.48	.0207	.0250	.0258	....	....
24.1	21.4	21.3	11.5	.0198	.0251	.0253	....	....
26.2	23.0	22.8	13.6	.0198	.0257	.0262	....	....
28.8	24.9	24.8	16.8	.0203	.0271	.0273	....	....
31.6	26.8	27.0	18.9	.0189	.0263	.0258	....	....
33.1	27.9	28.1	20.6	.0187	.0265	.0261	....	....
37.4	30.7	31.5	25.9	.0185	.0275	.0261	....	....
38.9	31.7	32.5	26.7	.0177	.0267	.0252	....	....
40.5	32.7	33.7	27.8	.0170	.0260	.0244	....	....
55.6	41.1	44.8	53.0	.0172	.0314	.0265	....	....
57.5	41.8	46.2	55.6	.0168	.0318	.0261	....	....
58.6	42.5	46.9	57.0	.0166	.0315	.0258	....	....
60.7	43.4	48.5	60.6	.0165	.0322	.0258	....	....
Means.	....	....	....	....	b' .02567	.02600	b' .00285	23.9

[Area of plate, 4 square feet.]

6.96	6.88	6.90	.73	.0150	.0176	.0153?	....	....
8.36	8.16	8.13	1.08	.0155	.0162	.0164?	....	....
10.7	10.3	10.2	1.29	.0113	.0123	.0125	....	....
13.8	13.1	12.8	2.00	.0105	.0116	.0122	....	....
14.8	13.8	13.6	2.26	.0103	.0119	.0122	....	....
17.3	16.0	15.7	3.05	.0102	.0119	.0124	....	....
18.1	16.6	16.3	3.33	.0102	.0120	.0125	....	....
21.0	18.9	18.6	3.69	.0084	.0104	.0107	....	....
23.2	20.7	20.5	5.26	.0098	.0123	.0125	....	....
25.3	22.3	22.1	5.90	.0092	.0119	.0121	....	....
26.7	23.3	23.1	6.71	.0094	.0124	.0126	....	....
29.0	25.0	24.9	7.60	.0090	.0122	.0123	....	....
31.1	26.5	26.6	8.96	.0093	.0128	.0127	....	....
32.1	27.2	27.3	8.93	.0086	.0121	.0120	....	....
34.4	28.9	29.2	9.26	.0078	.0111	.0109	....	....
43.1	34.3	35.7	13.4	.0072	.0114	.0106	....	....
44.5	35.1	36.7	15.5	.0078	.0126	.0105	....	....
46.1	36.0	37.9	15.6	.0073	.0120	.0108	....	....
48.5	37.4	39.7	20.3	.0086	.0150	.0129	....	....
51.2	39.8	41.6	19.8	.0076	.0125	.0114	....	....
52.5	40.5	42.6	22.0	.0080	.0134	.0122	....	....
54.5	41.0	44.0	22.5	.0076	.0134	.0116	....	....
56.3	41.3	45.4	23.3	.0073	.0136	.0113	....	....
58.5	42.9	46.9	21.7	.0064	.0118	.0099?	....	....
Means.	....	....	....	....	b' .01175	....	b' .00294	23.9

The velocity of the wind has been computed by three different formulæ, namely: The well-known Robinson formula,

$$V = 3v$$

which values appear in the first column. The second and third columns contain velocities computed respectively by the two following formulæ:

$$V = .263 + 2.95v - .0407v^2$$

$$\log V = .509 + .9012 \log v$$

The last three columns of constants are computed on the assumption that the pressure of the wind varies as the square of the velocity, and correspond, respectively, to the velocities in the first three columns. It is observed that this factor is not constant if velocities are taken by the Robinson formula, but that for the quadratic equation, except for irregular variations, due, it is believed, to errors of observation, the value is practically constant up to velocities between 25 and 30 miles, and that above this the values steadily increase. If the last column be considered, it appears that the values throughout are practically constant and the same as those of the upper portion of the preceding column. In a previous report upon anemometer studies, I have already expressed my conviction that velocities can not be accurately computed by the quadratic equation for conditions higher than 30 miles per hour, or thereabouts, and that the logarithmic formula was undoubtedly more accurate. These conclusions are strikingly confirmed in the wind pressure experiments here given, and I am, therefore, convinced that so far as can be determined from experiments of this kind, the pressure of the wind varies as the square of the velocity.

If we compare the corresponding results obtained with the plate of 9 square feet and those with the plate of 4 square feet, we find further that the pressure varies strictly in proportion to the area of the plate. A critical examination of the constants in the case of the plate of 4 square feet shows greater irregularity than those for the plate of 9 square feet. It should be noticed in this connection that a much greater number of observations were made with the larger than with the smaller plate; moreover, the first two and the last observation with the plate of 4 square feet have been queried, as they do not agree well with the other results. Some explanation of this is found in the fact that they are results of single observations only, while nearly all the other values are the mean of several observations.

It remains now to say that the mean barometric pressure during my experiments was 23.9, and that the final value of the constant, viz, .0029, needs to be slightly altered in order to reduce to the condition of normal action of the wind. The actual direction of the wind, as before mentioned, was inclined upwards; and this, I found, was also practically a constant quantity, particularly so as nearly all my experiments were made with the wind in one direction. The amount of this inclination, as nearly as it could be determined, may be taken at about 15°. We do not, perhaps, know very well the law of variation of pressure with angle of inclination, but I am disposed to increase the above factor in proportion to the $\cos^2$ of the angle of inclination, which gives .0032. I will assume, further, that the wind pressure is proportioned to the density of the air; therefore, the factor reduced to 30 inches barometric pressure becomes .0040, and the formula for computing wind pressure under barometric pressure of 30 inches may be expressed as follows:

$$P = .0040 V^2 S$$

where V is wind velocity in miles per hour, P is the pressure in pounds per square foot, and S is the area of the plate.

This formula being determined by direct comparison of the anemometer and pressure plate, can always be used whenever the velocity is measured by the Robinson anemometer. The coefficient .0040 differs from a generally accepted value, viz: .005, and from the value .0029, found by Messrs. Whipple and Dines by about the same amount, being between the two.

For engineering purposes this formula gives very closely, I think, the actual pressures corresponding to velocities computed by the logarithmic formula, as applied to the Robinson anemometer, and this is the instrument almost universally used in measuring wind movements. Where the Robinson anemometer, having its dials graduated to read miles, is used, the observed velocity can easily be reduced to the true velocity by reference to Table I.

In estimating the strains to which engineering structures may be subjected by winds, the maximum pressures are, of course, the most important. The above formula gives a mean pressure corresponding to a mean wind velocity. It is important to note that momentary pressures as much as 35 per cent. in excess of the above mean pressure may continually occur and recur. If their rate of occurrence be at all synchronous with a natural time of vibration of the structure or any part thereof, remarkable effects may follow.

While the values given in Table I are worked out from experiments at only low velocities, yet the check afforded by the wind pressure experiments at velocities as high as 60 miles per hour is most satisfactory, and the extension of the table above this point undoubtedly gives results far more accurate than the ordinary indicated velocities.

Little need be said here of the vast importance of accurate information in respect to the measurement of high wind velocities and the closely allied problem of the laws relating to wind velocity and pressure. The matter is of the greatest interest to engineers, and recent experiments have yielded remarkable results compared with older investigations. The problems present so many serious difficulties that many experimental results not having been made by proper methods, or with sufficient care, have given highly discordant results.

It is trusted this office may yet carry on valuable experimental investigation in this direction. The work already done forms an excellent foundation from which to start, and the experience gained is of the greatest possible advantage. Several methods are recommended by various authorities, and it is highly desirable that results be obtained by all, if possible. The problem is too complicated and extensive to be solved by even a considerable number of experiments. Results that will be acceptable and satisfactory to scientists in general must be sustained by every possible experimental proof. Investigators are, in general too eager for results and pass over sources of error too carelessly. The whole subject needs thorough investigation, which will not only require considerable time but special and more or less elaborate facilities.

Experiments upon trains of cars are too much trammeled by outside circumstances to serve more than as a highly desirable "check" on other studies. A large whirling machine, permanently set up, capable of being run at high velocities and wholly at the disposal of the operator, affords, in my opinion, the most practical method for a full investigation of this question. Under such circumstances the work without being restricted and limited to a prescribed time and a special occasion could be taken up and prosecuted as the emergencies of the experiments themselves demanded, until unquestionable results were obtained.

Such results would be of the greatest value and have great weight as compared with values derived from what, in some respects may be termed spasmodic investigations and which, though often very good in themselves, are little more than a peculiar result for a special condition.

Certain phases of the anemometer problem render it highly advisable that experiments upon the whirler be made not only in still air but also with the air in motion. This could be realized by first experimenting in the free air, and afterwards closing up the space occupied by the whirler.

APPENDIX 26.

THE DESTRUCTIVENESS OF TORNADOES.

By direction of the Chief Signal Officer a special study of this question has been undertaken with a view of summarizing all the facts in possession of this office, and of obtaining, if possible, an accurate estimate of the loss of life and property by these violent outbursts. The materials for such study may be briefly enumerated.

(1) The Monthly Weather Review. This has been published since July, 1873, and, while in the earlier years there was only the briefest mention of violent storms, yet in later years the reports have been quite full. It is believed that no serious tornado has been omitted in the Review. The estimates of loss of life and property are not quite as full as could be desired.

(2) A manuscript prepared under the direction of Lieutenant Finley, containing data relating to more than 2,000 violent storms. In this manuscript the loss of life seems to be fairly well determined, though the estimates of loss of property have been found not entirely satisfactory.

(3) Special reports of a few of the more destructive tornadoes prepared by observers of the Signal Service.

(4) Reports in several of the State weather service bulletins. In many instances this is the only reliable authority for data regarding tornadoes. Dr. Hinrich's reports from Iowa are specially satisfactory in this regard.

(5) Newspaper reports.

(6) Since the beginning of May, 1890, special requests have been sent out by this office asking for names of persons killed and the total loss of buildings in each tornado. Before proceeding with this discussion it may be of some value to give an illustration of the necessity and advantage of this latest procedure. A metropolitan insurance journal published a statement that the loss of life by tornadoes in this country, for June, July, and August, 189 , as culled from the newspapers, was 328. By direction of the Chief Signal Officer a careful list was made of the names of all those reported by a prominent paper in each of three different cities as having lost their lives by tornadoes. There were 196 persons in this list. In both of these lists there were included 100 persons who were drowned in the violent wind storm on Lake Pepin, which it has been found was not a veritable tornado, for if the people had been on shore no loss of life would probably have occurred. Deducting this number we have 228 in the first list, and 96 in the second. During these 3 months careful inquiry by letter had been made regarding these tornadoes and manuscript reports had been received from nearly every town in which a violent wind storm had been experienced. These reports make the loss of life 64 in the storms given by the papers. The most serious discrepancies were at Bradshaw, Nebr., newspaper loss, 15; actual loss, 7. Sublette, Ill.: reported, 17; actual, 12. Gervais, Minn.: reported, 11; actual, 6. In the manuscript reports received by this office there were names of 14 persons who lost their lives at places making no report in the newspapers, this gives a total of 78 during these months. It is hoped that in the future this office will be in possession of accurate statistics regarding these important facts in relation to tornadoes.

All of the sources of information mentioned above have been collated and a card index and catalogue nearly completed. In this index the authority, time, the width and length of path, and the loss of life and property are given, making a convenient compendium for future reference. It is proposed by special correspondence from time to time to revise this list and make it as complete as possible. The director of the Iowa State weather service has already signified his willingness to assist in this revision of tornadoes in his State. An idea of the advantages to be derived from this compendium may be had from the following illustration. An item has gone the rounds of the press that one of the severest tornadoes in New England occurred at Pittsfield, Mass., in June, 1879. No note of this tornado could be found in the records filed at this office, and a letter sent to Pittsfield elicited the information that the tornado occurred on July 16, 1879, and the loss was about $20,000. No mention is made in the press reports of the tornado at Wallingford, Conn., on August 9, 1878, the most severe that ever visited New England, in which 34 persons were killed and a property loss of $200,000 occurred.

WHAT IS A TORNADO?

It seems self-evident that the loss of life and property should be the most important characteristic to be noted in studying our tornadoes. The most terrifying cloud appearances or sounds can have no special interest if the cloud does not reach the earth. No adequate idea can possibly be gained of the power of a tornado if it does not cause destruction of some kind.

The establishment of a scale of destructiveness is essential at the very outset of our investigation, as all subsequent work must depend on this scale or classification. In some lists tornadoes have been given as having a certain width and length, and this is the only idea we can gain as to destruction. But this is entirely inadequate for our purpose. Another difficulty experienced in making up a tornado catalogue has been the extreme indefiniteness of the description; for example, one tornado is given as occurring on September 9, 1884, and traversing nine counties in Minnesota and Wisconsin, causing a loss, in a strip half a mile wide, to the extent of $4,000,000. A careful study of the loss in this tornado has shown only two towns severely injured; the one, Clear Lake, Wis., with a loss of $150,000, and the other, Marine Mills, Minn., with a loss estimated at about $50,000.

It would seem that every severe tornado ought to have a definite name and description. The resort to the name of a county for a tornado should only be made when every effort to obtain the name of a town has failed, or when it is impossible to designate any one town out of a large number injured in a county. One of the more serious difficulties met with in establishing a scale has been the combining together of the loss of structures with that to crops, orchards, standing timber, etc., by hail, heavy rain, floods, etc. For our purpose and in all comparisons for insurance interests it is essential to separate out very carefully all the loss to structures.

SCALE.

A provisional scale of three classes was adopted for a beginning. It is intended that in this scale violence rather than property loss shall be the ultimate criterion, but in most cases the two are practically the same, and it would be found well nigh impossible to separate them at this stage of our information. We may put all the most severe tornadoes in our list as having the scale of 3. As a matter of fact it has been found desirable to place all tornadoes having a loss of about $50,000 in this list, though one, owing to great violence, will be found in which the loss was only $20,000. The average loss by the fifty-eight tornadoes of class 3 is a little over $200,000 each. The average loss of life by these tornadoes is thirteen.

We may place in class 1 all violent storms in which there was least destruction. On many accounts it would appear wiser not to give this class any place at all in a list of violent storms, but no harm will come if we rate the loss small enough, and in a study of losses by high winds in connection with insurance, it would be essential to have these storms counted. The average loss by the violent storms of class 1 is put at $3,000, though there are indications that even this is too great.

We may put all other violent storms in a class between these two or in class 2. The average loss by tornadoes of this class is estimated at $20,000 but it will be understood that there are very few facts upon which to base this estimate, and it is put at this figure in order to leave ample margin on the side of too great loss. There is no desire whatever to diminish the estimate of the actual destruction caused by tornadoes. There are about 1,000 violent storms in each of these two classes.

While there is great difficulty in determining actual property loss in a tornado it seems equally as difficult to obtain the loss of life. The reasons for this may be briefly enumerated:

(1) The first estimate is usually made in a hurried manner, and before all the facts are fully ascertained, but afterward this estimate is too often the only one quoted. After the Louisville, Ky., tornado of March 27, 1890, a report was started that 500 had lost their lives and a month afterward the report was widely circulated that 500 people had lost their lives in Kentucky and other States near by. The loss of life in Louisville was 76 and in all the region about a careful estimate gave 59 more, though these figures have not been accurately verified as yet. This would make the total 135 instead of 500.

The most terrible tornadoes of modern times seem to have occurred in Alabama, Georgia, and one or two other States on February 19, 1884. It has been repeatedly stated that the number killed in this one day's tornadoes was 800, but quite a careful canvas of the region puts the actual loss of life at 182.

(2) Sufficient care is not taken to note the names of persons killed, in this way people killed have been counted twice and sometimes thrice over.

(3) Care is not taken to distinguish between the loss of life through a high wind and that by lightning, flood, hail, etc., which accompany the tornado. An example of this last may be found in the report of a tornado at Erie, Pa., on July 26, 1875,

which has been repeatedly published in long lists of tornadoes. This tornado has a reported loss of 134 lives and a property loss of $500,000. No mention of such a storm occurs in the Weather Review, but after a long search it was found that on July 26, 1874, a great flood occurred at Pittsburgh, Pa., in which the above reported loss of life and property had occurred. The following table exhibits a summary of loss of life and property by tornadoes and violent wind storms from 1872 to 1889 inclusive:

Class.	Number tornadoes.	People killed.	Average each storm.	Property loss.	Loss for each storm.
3	*58	755	13	$11,894,700	$205,080
2	†1,000	1,071	1 in two storms	†20,000,000	†20,000
1	†1,000			†3,000,000	†3,000
Total	†2,058	1,826	About 1	†34,894,700	†16,955

* Including tornadoes of. † Approximate.

This summary is very suggestive. It is probable that when the statement is made that this country has had 2,400 tornadoes in the last eighteen years many persons picture to themselves tornadoes as severe as those in class 3, or when one reads the description of a western tornado he thinks at once of the same class of storm. This idea has been also fostered from the frequent publication of photographs showing the worst destruction in the worst tornadoes. Fortunately the whole number of class 3 is only 58, with an average of 13 killed and $205,000 property destroyed. In the remaining 2,000 only one person was killed, and there was an average loss of $11,500. Professor Loomis, forty-eight years ago, showed that the average loss of life was one to each tornado, which is quite in accordance with the value found here when we group all the tornadoes together. It is a matter of great surprise, and is frequently alluded to, that notwithstanding the terrible energy developed in these tornadoes and the enormous destruction of houses, there are so few lives lost; for example, in the recent Wilkes Barre, Pa., tornado of August 19, 1890, 200 houses in the city were totally demolished, and yet only 16 lives were lost. This immunity from serious loss of life should calm our fears regarding the imminent danger in these outbursts. Houses are generally turned over or demolished near the foundation; they are taken away so suddenly that the inmates are often left unharmed without a roof to cover them. But the principal reason for this immunity would appear to be the ample warning that everyone has from the black-looking clouds before the tornado and the tremendous and unmistakable roar which may be heard fifteen minutes and sometimes half an hour before the outburst. This warning sound causes people to seek their cellars and thus save themselves. Another reason almost as important is the extreme narrowness of the cloud. Descriptions often make the tip of the cloud appear like an elephant's trunk or like the car hanging down from a balloon; often this pendant cloud appears to be not more than 10 feet across. It is easy to see that with such a cloud the width of extreme destruction can hardly be more than 100 or 200 feet. Persons have stood within 150 feet of a tornado and have felt no severe wind. Well-built structures have been destroyed while, repeatedly, very frail structures have been untouched, though only a few feet away, and, what is more singular still, right in the path of the tornado.

COMPARATIVE LOSS.

An instructive comparison may be made between the average loss of life by tornadoes and by lightning. As we have just seen the whole number of people killed by tornadoes, as reported, were 1,826 in 18 years, or an average of 101 per year. During the months, March to August, 1890, the whole number of casualties by lightning carefully culled, so as to prevent duplication, from three prominent newspapers was 115. This number has been given as over 200 per year by another authority. While it is quite probable that the total of deaths by tornado has not been reported, yet there seems little doubt that the average loss of life by lightning is greater than by tornado.

If a tornado should visit a town and destroy a certain number of houses, we could compare the total number destroyed with those left, and the same thing may be said of the lives lost; for example, in the Wilkes Barre tornado already alluded to, 200 out of about 4,000 houses were destroyed and 16 out of about 30,000 people lost their lives. This, however, would give very little idea of the real tornado destruction; we would need to go over the records for a number of years and take into consideration much larger areas, as, for example, the whole State of Pennsylvania, in order to get a relative statement of any value. If this were done we would see that the comparative risk of any single house in a State being struck would be 1 in 100,000 in some States and even a still less risk in others. No severe tornado ever visited Kentucky in historical times until the very severe one of March 27, 1890, and this State has not been considered in the category of tornado States. It would be a great mistake to suppose that the seasons or our weather have changed and that we are entering upon a period of more severe and destructive tornadoes. We may consider that the average loss of life and property that has occurred during the past eighteen years will be a good criterion for the future, and while some years will show an increase above the normal, others will fall below it. Thus the years 1883 and 1884 have the reputation of being those having the most tornado destruction in modern times. There are some reasons for believing that during years of maximum sun spots there is a slight tendency to an increase in tornadoes.

This interval is once in eleven years, but it will require many more years of careful observation and record to settle this point. It is barely possible, also, that the multiplication of lines of rails, wires, electric plants, etc., may have an ultimate tendency to modify the influences now controlling tornado development, but this is altogether too slight an effect to be taken account of at present.

Another method of ascertaining relative tornado destruction would be to compare the number of towns visited with the total in the State, but this would require great care, and would need weighting both for the relative size of towns and relative destruction in each. This would be entirely impossible in our present state of information on the subject. The Chief Signal Officer has directed that some idea of this relative destruction be obtained from a comparison of the total area devastated by tornadoes in the tornado States with the area of the State. Many of these tornadoes have had an estimate made of the width and length of path of destruction. The question arises: Can we obtain an adequate idea of the destructive area covered by a tornado from these reports? In doing this we must take great care not to be misled by the data. The difficulties are as follows:

(1) The width of path is given to the limit of winds which have blown off chimneys or blown down wheat, corn, or crops.

(2) The length is frequently determined by locating the first town struck, and also the last, then measuring the distance between. We have already had a case in the tornado supposed to have had a width of half a mile through nine counties, in which the total loss was less than $250,000.

(3) Often measurements would be made at right angles to a track taking in two distinct tracks and giving a total width, including both tracks. It is well known that tornadoes have high winds from thunderstorms in lines parallel to the main track on either side. In the Wilkes Barre tornado there were four such lines.

(4) Usually the tracks that are measured are of the more severe tornadoes, and it would be manifestly improper to apply them to all tornadoes in order to get an average destruction, but we must apply them by weight to each class of storm.

(5) Often tornadoes have been reported when a funnel cloud has been seen, even though it did not reach the earth. All such cases have been thrown out in this discussion, however, when the description warranted such treatment.

Bearing these facts in mind we shall be able to make due allowance for the final results.

The average length of the tornadoes reported was 5.9 miles. This is an enormous length, and is probably ten times greater than the actual length of tornadoes in general. If we multiply this length by the width it will give the total area for each tornado; then multiplying by the total in each State each year we obtain the average area destroyed. If then we divide the State area by this figure we shall obtain a relative value between the total limited or minor destruction by tornadoes and the area of the State. The following table gives such relative numbers:

Alabama	1: 7,866
Arkansas	1:14,418
Georgia	1: 6,696
Illinois	1: 8,172
Indiana	1: 6,210
Iowa	1: 7,164
Kansas	1: 9,720
Michigan	1:18,396
Missouri	1: 6,336
Ohio	1: 4,554
Pennsylvania	1: 9,972
Wisconsin	1:12,042

In this table it is plain that the smaller figures indicate a relative larger area of destruction. The figure for Ohio is very remarkable, and is due, probably, to a greater number of violent storms being reported from this State. In considering the area of such a State as Kansas, or any State not uniformly settled in all parts, the number in this table is likely to be too great or to show too low a frequency per square mile of State.

We may also obtain some idea of these relative numbers by considering the area of destruction covered in all well-studied tornadoes and then applying that area by weight to the storms of the State. The following table shows such relative numbers:

Alabama	1 : 480, 600
Arkansas	1 : 712, 800
Georgia	1 : 504, 000
Illinois	1 : 185, 400
Indiana	1 : 330, 000
Iowa	1 : 432, 000
Kansas	1 : 436, 500
Michigan	1 : 914, 400
Missouri	1 : 406, 800
Ohio	1 : 243, 000
Pennsylvania	1 : 468, 000
Wisconsin	1 : 475, 900

These results are materially different from those given before, but they seem to be the more satisfactory of the two. It should be noted that the above methods, comparing destroyed with undestroyed areas, are quite difficult to make complete from lack of data and must be used with great caution.

RELATIVE LOSS BY FIRE AND TORNADO.

There seems to be still another method of study free from most of the defects alluded to above. We may compare directly the loss of property by tornadoes or violent winds with that by fire. This comparison will be all the more valuable because the principal use of such figures, after showing the true status of relative loss by fire and tornado, will be in determining how much insurance premium should be paid for tornadoes as compared with that for fire. The main difficulty in such comparison lies in the incompleteness of returns in the case of loss by tornadoes. The loss by fire is known and recorded within 4 per cent. of the truth, but in the case of tornadoes it is necessary to estimate the loss for nearly all except those of class 3; the loss by this latter class is known quite accurately. The fire loss for the years, 1876 to 1884 has been published, and we may compare that by tornadoes for the same period.

The following table gives the proportionate loss by these two:

Alabama	1 : 9
Arkansas	1 : 9
Georgia	1 : 12
Illinois	1 : 15
Indiana	1 : 23
Iowa	1 : 9
Kansas	1 : 3
Michigan	1 : 57
Missouri	1 : 12
Ohio	1 : 34
Wisconsin	1 : 14

Considering all the States, the average loss is 1 : 14. These figures are prepared from the first review of the data in hand; they may be regarded as approximately accurate.

It is of the utmost importance that in making a report of a tornado great care be taken in recording the names of persons killed and in making an estimate of property destroyed. The loss to structures by high winds should be placed by itself and should not be joined with the loss by any other accompaniment of the tornado. There would be no harm, if one so desired, to give the loss to crops and by floods also in a separate column. It is hoped that people residing in the Western States will have it in mind to help on this work by obtaining statistics. There is no doubt of a tornado evil, but there is great danger that it will be exaggerated much to the harm of the individual States. This can only be prevented by collecting perfectly reliable statistics of these outbursts.

THE MOST DESTRUCTIVE TORNADOES SINCE 1872.

(1) November 22, 1874, Tuscumbia, Colbert County, Ala. Scale 3. Struck the town at 6 p. m. Nearly half the town of 1,400 inhabitants destroyed. 10 persons killed and 30 wounded. 100 buildings damaged or destroyed. Loss $100,000 estimated.

(2) May 6, 1876, Chicago, Cook County, Ill. Scale 3. Moved from SW. to NE. accompanied by rain, thunder and lightning. Bounding like a ball it apparently reached the ground but two or three times. Loss $250,000.

(3) June 4, 1877, Mount Carmel, Wabash County, Ill. Scale 3+. 200 to 400 feet wide. Great destruction of property. 16 killed, 100 wounded. Loss $400,000.

(4) July 7, 1877, Pensaukee, Oconto County, Wis. Scale 3. Moved from NW. to SE. lasting about two minutes. 8 killed, many wounded. Loss $300,000.

(5) June 1, 1878, Richmond, Ray County, Mo. Scale 3. Entered the town at 4:05 p. m. from the south sweeping everything clean. Heavy sills 18 inches square and 16 feet long were swept away. Path through the city 750 feet wide and 1 mile long in which space not a single house was left. 13 killed, 70 wounded, 100 buildings destroyed. Loss $100,000 estimated.

(6) August 9, 1878, Wallingford, New Haven County, Conn. Scale 3+. At 5:45 p. m. a dark cloud approached from the west. "Electricity of the most terrific kind filled the air." "Straight rods of fire came down from the sides of the cloud to the earth." The débris of houses were scattered along in parallel lines as though a mighty river had passed. The greatest destruction occurred in a path 400 feet wide and ½ mile long. 34 killed, 70 wounded, 40 dwellings, 50 barns, 1 church and 1 schoolhouse were destroyed or badly damaged. Loss $200,000.

(7) April 14, 1879, Collinsville, Madison County, Ill. Scale 3—. Struck town at 2:45 p.m. Nearly every grave-stone in cemetery was leveled. 1 killed, several wounded, 60 buildings destroyed. Loss $50,000.

(8) April 16, 1879, Walterboro, Colleton County, S. C. Scale 3. Rainfall after tornado, which struck at 3:45 p. m., was unprecedented. Wind on north side had a downward crushing tendency, on the south side an upward lifting action. 4 people saw balls of lightning running along the ground. 16 killed, 50 buildings destroyed. Loss $200,000.

(9) March 4, 1880, Indianapolis, Marion County, Ind. Scale 3. Moved from SW. to NE. with a zigzag course through the city. Loss $100,000.

(10) April 18, 1880, Fayetteville, Washington County, Ark. Scale 3. Struck town at 8:30 p. m. Not a building escaped in its path, 90 feet wide, through the town. 2 killed, 20 to 30 injured, 100 buildings destroyed. Loss $100,000.

(11) April 18, 1880, Marshfield, Webster County, Mo. Scale 3. Struck at 5 p. m., near town, trees 3 feet in diameter, for a space several hundred yards wide, were lifted entirely out of the ground. Every house in the town of 2,000 people was destroyed or badly damaged. 65 killed, 200 wounded. Loss $110,000.

(12) April 18, 1880, Licking, Texas County, Mo. Scale 3. Struck at 8:15 p. m. Entire town of 388 people destroyed, except 3 houses; 300 left homeless. 1 killed, 17 wounded, 65 houses destroyed. Loss $50,000.

(13) April 18, 1880, Beloit, Rock County, Wis. Scale 3—. Struck at 5 p. m. Moved from SW. to NE. Several killed, many injured, many houses destroyed. Loss $75,000.

(14) April 24, 1880, Taylorville, Christian County, Ill. Scale 3—. Struck at 7 p. m. 6 killed, 25 houses destroyed. Loss $60,000.

(15) April 25, 1880, Macon, Noxubee County, Miss. Scale 3—. Struck at 8:30 p. m. 22 killed, 72 injured, 55 buildings destroyed. Loss $100,000.

(16) May 10, 1880, Arrowsmith, McLean County, Ill. Scale 3—. Loss $100,000.

(17) May 28, 1880, Savoy, Fannin County, Tex. Scale 3—. Time 10 p. m. Town almost destroyed. 15 killed, 60 wounded, 48 buildings razed. Loss $50,000.

(18) June 14, 1880, Glendale, Hamilton County, Ohio. Scale 3—. Time 8 p. m. Loss $80,000.

(19) April 12, 1881, Hernando, De Soto County, Miss. Scale 3—. In some spots hailstones as large as hens' eggs fell. Electricity and thunder not seen nor heard. 10 killed, 25 buildings demolished. Loss $50,000, estimated.

(20) June 12, 1881, Jackson, Andrew County, Mo. Scale 3—. A great deal of destruction occurred at King City, DeKalb County. In county and vicinity 5 killed, 80 buildings razed. Loss $250,000.

(21) July 15, 1881, New Ulm, Brown County, Minn. Scale 3+. 6 killed, 53 wounded, nearly 300 buildings destroyed or seriously damaged. Loss in town $174,677.

(22) September 24, 1881, Quincy, Adams County, Ill. Scale 3. Time 5 p. m. Storm accompanied by terrific lightning and thunder. 9 killed, 21 buildings razed. Loss $100,000.

(23) April 18, 1882, Brownsville, Saline County, Mo. Scale 3. Time 4:20 p. m. 11 killed, 10 brick houses, 40 others and 1 school razed. Loss $150,000.

(24) May 8, 1882, McKinney, Cleveland County, Ark. Scale 3—. 50 buildings destroyed. Loss $30,000.

(25) May 8, 1882, Mount Ida, Montgomery County, Ark. Scale 3—. Time 5:30 p. m. 2 killed, 100 buildings demolished. Loss $50,000.

(26) June 17, 1882, Grinnell, Poweshiek County, Iowa. Scale 3+. Time 8:45 p. m. 60 killed, 150 injured, 140 houses reduced to ruins in 5 minutes. Loss $600,000.

(27) April 22, 1883, Beauregard, Copiah County, Miss. Scale 3+. Time 3 p. m. Every house and store destroyed in the town of 600 people. Solid iron screw of a cottonpress weighing 675 pounds was carried 900 feet. 29 killed, 40 wounded. Loss $450,000.

(28) April 22, 1883, Wesson, Copiah County, Miss. Scale 3—. 13 killed, 60 injured, 27 houses destroyed. Loss $20,000.

(29) May 13, 1883, Kansas City, Jackson County, Mo. Scale 3. Time 8:30 p. m. 200 houses destroyed. Loss in town and vicinity $300,000.

(30) May 13, 1883, Macon City, Macon County, Mo. Scale 3—. Time 8:30 p. m. 5 killed, 107 buildings razed. Loss $150,000. This destruction and loss may include the whole county.

(31) May 13, 1883, Oronogo, Jasper County, Mo. Scale 3—. 6 killed, 33 injured, nearly all houses destroyed. Loss, $75,000.

(32) May 18, 1883, Racine, Racine County, Wis. Scale 3—. Time 7 p. m. 16 killed, 100 injured. Loss $75,000.

(33) June 2, 1883, Greenville, Hunt County, Tex. Scale 3—. Time 7:15 p. m. 1 killed, several wounded, 40 houses razed. Loss $70,000.

(34) June 11, 1883, Brush Creek, Fayette County, Iowa. Scale 3—. Town one-third destroyed. Loss $40,000.

(35) August 21, 1883, Rochester, Olmsted County, Minn. Scale 3. Time 6:36 p. m. Large part of town destroyed. 26 killed, 135 houses destroyed. Loss in county $200,000.

(36) February 19, 1884, Leeds, Jefferson County, Ala. Scale 3—. Time 1:20 p. m. Hail of unusual size. 11 killed, 31 wounded, 27 houses and many barns destroyed. Loss $80,000, estimated.

(37) April 27, 1884, Jamestown, Greene County, Ohio. Scale 3. Time 5 p. m. 6 killed, two-thirds of buildings destroyed. Loss $200,000.

(38) July 21, 1884, Dell Rapids, Minnehaha County, Dak. Scale 3. Time 3:05 p. m. 7 killed, many buildings destroyed. Loss $100,000.

(39) September 9, 1884, Clear Lake, Polk County, Wis. Scale 3. Time 5 p. m. Greater part of town in ruins. 3 killed, 40 buildings destroyed. Loss $150,000.

(40) August 3, 1885, Camden, Camden County, N. J. Scale 3+. Time 3:20 p. m. Path from one to two squares wide. 6 killed, 100 injured. 500 houses razed or unroofed. Loss $500,000.

(41) Septmber 8, 1885, Washington Court House, Fayette County, Ohio. Scale 3+. Time 7:30 p. m. Width of path 250 feet. Town almost destroyed. 6 killed, 100 injured, 40 business houses and 20 residences razed. Loss $500,000.

(42) April 14, 1886, Coon Rapids, Carroll County, Iowa. Scale 3—. Time 5:05 p. m. 1 killed, 32 buildings razed. Loss $55,000.

(43) April 14, 1886, St. Cloud, Stearns County, and Sauk Rapids, Benton County, Minn. Scale 3+. 74 killed, 136 wounded, 138 buildings destroyed. Loss $400,000.

(44) May 11, 1886, Kansas City, Jackson County, Mo. 33 killed. Loss $100,000, estimated.

(45) May 12, 1886, Attica, Fountain County, Ind. Scale 3. Time about 6 p. m. In vicinity 9 killed, 200 houses razed. Loss $200,000.

(46) April 15, 1887, St. Clairsville and Martin's Ferry, Belmont County, Ohio. Scale 3. Time 3:20 p. m. None killed. About 200 buildings of all kinds demolished. Loss $250,000.

(47) April 21, 1887, Prescott, Linn County, Kans. Scale 3. Time 5:30 p. m. 20 killed, 237 wounded. 330 buildings razed in the vicinity. Loss $150,000.

(48) April 22, 1887, Mount Carmel (near), Wabash County, Ill. Scale 3—. Time 6 p. m. 2 killed, several wounded, everything in path destroyed. Loss $50,000.

(49) April 22, 1887, Clarksville (near), Johnson County, Ark. Scale 3. Time 6:30 a. m. 20 killed, 75 to 100 injured in vicinity. Loss $150,000.

(50) June 16, 1887, Grand Forks, Grand Forks County, Dak. Scale 3; time, 3:22 p. m., 4 killed, 50 or more houses, besides hundreds of barns, etc., razed. Loss, $150,000.

(51) February 19, 1888, Mount Vernon, Jefferson County, Ill. Scale 3+ 18 killed, 54 wounded, 100 buildings razed. Loss, $400,000.

(52) May 27, 1888, Hillsboro, Hill County, Tex. Scale 3—. Many buildings destroyed. Loss, $100,000.

(53) August 21, 1888, Wilmington, New Castle County, Del. Scale 3; 1 killed, 20 wounded. Loss, $100,000 to $200,000.

(54) January 9, 1889, Brooklyn, Kings County, N. Y. Scale 3; time, 7:40 p.m. (Eastern). Width 500 to 600 feet; length, 2 miles; whirl from right to left. Roar heard 10 or 15 minutes before. Loss, $300,000.

(55) January 9, 1889, Reading, Berks County, Pa. Scale 3; time, 5:40 p.m. Swept from west to east in a path 60 to 100 feet wide. Wind often seemed to crush from above; 40 killed. Loss, $200,000, estimated.

(56) January 12, 1890, St. Louis, St. Louis County, Mo. Scale 3; time, 4 p.m. Moved to northeast in a path 500 to 2,000 feet wide. Heavy rain for 3 minutes. Greatest damage where path was narrowest; 3 killed, 100 houses razed. Loss, $250,000.

(57) March 27, 1890, Metropolis, Massac County, Ill. Scale 3 —; 1 killed, 50 injured. Loss, $150,000.

(58) March 27, 1890, Louisville, Jefferson County, Ky. Scale 3 +; time, 7:57 p.m. Path at beginning 600 feet, as it left the city, 1,500 feet. Cloud did not quite reach the earth. Great damage to property; 76 killed, 200 injured. Loss, $2,250,000.

This list comprises all the most destructive storms that have been reported as far as a definite locality was mentioned. It has been found exceedingly difficult to determine the loss in many cases, because an estimate has evidently been made of the loss to crops, orchards, etc., from the rain, hail, and floods that accompanied the tornado, and not from the wind itself. Again, the loss reported evidently referred to a large region in the country and not to any specific town. Some of these may be enumerated as follows:

	Loss.
June 12, 1881, DeKalb and other counties in Missouri	$200,000
November 5, 1883, Greene and other counties in Missouri	150,000
November 21, 1883, Izard County, Ark	300,000
April 14, 1886, Cass County, Iowa	160,000
May 11, 1886, Pettis and other counties in Missouri	500,000
May 12, 1886, Greene and other counties in Ohio	1,000,000
May 14, 1886, Hardin and other counties in Ohio	720,000
May 14, 1886, Huron County, Ohio	500,000
May 14, 1886, Seneca County, Ohio	300,000
May 14, 1886, Mercer County, Ohio	250,000

It is highly probable that in some of these cases the losses from one county have been estimated in another, though this has been avoided as much as possible. It is very much to be hoped that more definite estimates will be made in the future. The loss to structures by the wind should be carefully distinguished from the loss of every other kind, by hail or flood and to crops, stock or orchards.

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